The New Zealand

Journal of Agriculture.

VOL. 50. WELLINGTON, 20TH MARCH, 1935. No. 3.

THE HYGIENIC PRODUCTION OF MILK ON THE FARM.

A REVIEW OF THE ADMINISTRATION BY THE LIVE-STOCK DIVISION OF THE REGULATIONS UNDER THE DAIRY INDUSTRY ACT, 1908, REFERRING TO THE REGISTRATION AND INSPECTION OF DAIRIES PRODUCING MILK FOR SALE.*

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IN New Zealand the legal authority to sell milk to the public is that granted by the Department of Agriculture, in accordance with the provisions of the Dairy Industry Act, 1908, and regulations made thereunder. Registration is effected by the Live-stock Division of the Department, the officers of which Division are entrusted with the duties of dairy inspection.

It is quite unnecessary to stress the well-recognized importance of and responsibility attached to the work of supervising the production of the public milk-supply. This responsibility, in so far as the Department of Agriculture is concerned, ends when the milk leaves the farm-gate. It includes, however, supervision of the entire process of the handling of milk on the farm, from the milking of the cow until the milk leaves the farm for distribution to the public.

The purity of the public milk-supply is a subject which of recent years is receiving increased attention in all countries. This development is particularly noticeable in England, where a complete revision is taking place in the attitude towards the sanitary control of milk. This might be said to have commenced with the introduction in 1923 of the Milk (Special Designations) Order, which prescribed the conditions under which graded milk might be sold in England. The amount of milk produced under the licensing system in England to-day is but a fraction of the whole; the volume is, however, increasing, and it is anticipated that in time it will amount to an appreciable proportion of the whole milk-supply of that country, in spite of the fact that the cost of production is thrown upon the farmer, and that the production of such milk does not always meet with the support that might be anticipated.

* Read before a meeting of the Royal Sanitary Institute at Wellington, on the 30th January, 1935.

In New Zealand the work of dairy inspection is carried out in their respective districts by stock inspectors. In the four large centres a veterinarian supervises the work, and carries out tuberculin testing of cows, &c. In some of the smaller municipalities where a departmental veterinarian is stationed, the duty of dairy inspection is entrusted to that officer.

It is gratifying to note that the subject of the purity of the milk-supply has of late years engaged greater attention from the public, and also local bodies. Such manifestations are of considerable value to those entrusted with the administration of the regulations, and offer distinct encouragement to the producer to raise the hygienic standard of production. The value of competition in this respect is readily observed. If, in any group of dairies supplying milk to a centre, certain dairymen establish a higher standard in production generally, the result usually is that others are forced, from a competitive point of view, to do likewise.

Owing to the climatic conditions of New Zealand allowing of the pasturing of dairy herds throughout the year, we are, in this country, in the fortunate position of having the cow-shed representing only what is practically standing accommodation for the cows during the milking process. It can be understood readily what a difference this makes in the sanitation of the shed when compared with those places in which cows are housed for a period each winter.

There follows an endeavour to summarize the essential details of farm dairy inspection involved in the direction of the production of a pure milk-supply. The first consideration, before any reference is made to the dairy premises, is the health of the cows.

The Health of the Dairy Herd.

In this connection, the diseases of cattle recognized as transmissible to man through milk are tuberculosis, *Brucella abortus* infection, cow-pox, foot-and-mouth disease. In this country we are concerned only with the first three.

Regular inspections of the cows in registered dairies, for the detection of tuberculous animals, are made by departmental veterinarians and stock inspectors. Clinically affected animals are condemned under the provisions of the Stock Act. Suspicious animals are subjected to the tuberculin test and reactors removed. Any dairyman wishing to have all his cows tested can have this done, free of charge, by the Department, and this practice now obtains to a certain extent in many centres. The tuberculin testing of all cows supplying milk for human consumption is not, however, compulsory. In the elimination of tuberculous cows from the milk-supply, advantage is taken of the biological test which is carried out at the Wallaceville Veterinary Laboratory. In this test composite milk samples from the entire herd are forwarded to the laboratory for guinea-pig inoculation. In the event of a positive reaction occurring, all the cows in the herd are subjected to the tuberculin test, and reactors removed, careful *post mortems* being conducted. During the year ended 31st March, 1934, five hundred and eighty-seven such samples were dealt with, of which eleven (1·87 per cent.) proved to be positive.

Brucella abortus infection in milk is now known to give rise to the condition termed undulant fever in the human being. Abortion infection in cows is very widespread, as is shown by the large number of cows which react positively to the agglutination test. Fortunately, however, infection in milk is not so common. In recorded cases of undulant fever in human beings, the Department of Agriculture co-operates with the Health Department in an endeavour to trace a source of infection in the milk-supply. It is, of course, not suggested that all cases of undulant fever are caused through infected milk, as it is well known that infection can occur through avenues other than by ingestion of milk.

Milk from cows suffering from cow-pox should not be used for human food. This requirement is covered by the regulations.

Diseases of Cattle which may render Milk harmful to Man.

Mastitis.—In other countries epidemics of septic sore throat have been recorded in which the infection was transmitted by milk. In some of these epidemics cows affected with streptococcic mastitis were declared to be the source of the infection, but in other outbreaks the circumstances seemed to point to the infection of the milk by dairy workers. It is generally accepted that the *Streptococcus mastitidis* which causes mastitis in cows is non-pathogenic to man. In routine dairy inspection cows which are found affected with mastitis are excluded from the milk-supply.

Septic Metritis.—Cows affected with this condition should not be allowed in the milking-shed. Similar precautions are taken in cases of cows with retained placental membranes.

Other Diseases.—Any disease of the dairy cow attended with a considerable disturbance of the general condition usually causes a decrease or a complete cessation of the milk-secretion. Although the milk is generally of normal appearance when secretion continues in such cases, it frequently contains an increased amount of mineral salts, has a salty taste, and coagulates prematurely. While it is not known that milk of this kind is harmful to man, the change in its composition is sufficient to justify its condemnation as a food.

When suppurating wounds or ulcerative inflammations are present in any part of the body, there is danger of the milk being infected with the pyogenic organisms.

Diseases of Man transmissible through Milk.

Milk may act as a carrier of the infection of certain specific diseases of man. From time to time epidemics in which the infectious agent has been disseminated by milk have been reported, particularly outbreaks of typhoid fever, diphtheria, and scarlet fever. Fortunately such outbreaks are not common in New Zealand.

Farm Dairy Inspection.

The hygienic qualities of milk depend very largely upon the conditions at the source of supply. A knowledge of these conditions can be obtained only by an inspection of the dairy premises. As an adjunct to dairy inspection, bacterial testing and

other laboratory methods of examining milk are of great service. These will not, however, reveal whether a high bacterial count, for instance, is due to conditions existing at the farm, or during transportation of the milk to the consumer. On the other hand, inspection of a dairy-farm will disclose the physical condition of the cows, the sanitary condition of the premises, the character of the equipment, the methods in use, and the proficiency of the dairyman and his employees. Laboratory examination of milk, then, is of distinct value, but to produce results must be combined with dairy inspection.

Inspection of dairy premises should include a survey of the following :—

(1) *The Stock-yard :* (*a*) Floor ; (*b*) Drainage ; (*c*) Available water.

(2) *The Cow-shed :* (*a*) Site ; (*b*) Floor ; (*c*) Drainage ; (*d*) Lighting ; (*e*) Ventilation ; (*f*) Available water-supply ; (*g*) Cleanliness in shed.

(3) *The Cows :* (*a*) Cleanliness ; (*b*) Stage of lactation ; (*c*) Clinical examination of cows for symptoms of disease.

(4) *Hygiene of Milking :* (*a*) Cleansing of the udder ; (*b*) Leg-ropes ; (*c*) Cleansing of milkers' hands ; (*d*) The cleansing of the milking machine ; (*e*) Cleansing of cans and other milk utensils.

(5) *The Milk-house :* (*a*) Location ; (*b*) Construction ; (*c*) Drainage ; (*d*) Ventilation ; (*e*) Water-supply ; (*f*) Strainer ; (*g*) Cooler ; (*h*) Storage.

(6) *Bottling of Milk on the Farm :* The sterilization of bottles and hygienic methods of bottling milk.

Under the above headings much extended descriptive detail can be entered into. Only short reference will be made, however, to some of the more important points.

The site of the shed is important in relation to the prevailing winds and sunshine, and as regards drainage. The proximity of other buildings—horse-stables, fowl-houses, &c.—should be noted. Such are breeding-places for flies, and are therefore objectionable when too close to a dairy. The condition of the yard has a considerable effect upon the cleanliness of the cows: concrete floors are essential in yards. It goes without saying that the floor of the shed must be of concrete, likewise drains and sumps. When cows are not housed, the cubic air-space of the shed is not of vital importance. Ventilation must, however, be sufficient to at all times ensure elimination of "cow-odour." In sheds in which a feed-trough runs in front of the cows, such trough should be of cement, as this alone allows of proper cleansing. Feed placed before a tuberculous cow may be contaminated by infected saliva and the disease in this way transmitted to other cows. A concrete trough minimizes this possibility. Leg-ropes are preferably detachable, so as to be capable of being washed and hung up to dry. Dirty leg-ropes are most objectionable, as they are handled by the milker before milking begins. In walk-through sheds the handles of the doors require particular attention.

The examination of the cow is one of the most important parts of dairy inspection. The veterinarian, or the stock inspector who has received a suitable training, is alone competent to carry out his duty. Careful clinical examination of the cows includes palpation of the udder and palpation of the superficial lymphatic glands.

The progress of milking requires special observation. Herein lies the supreme test of the mentality of the dairyman for his job. Dirty milking procedure can only result in high bacterial count. Clause 13 of the regulations reads, "No person shall take milk from any cow whose milk is intended to be sold or used for human food, nor permit any such milk to be taken, until the udder and teats of such cow have been thoroughly cleansed." And in respect to the milker himself, clause 14 states, "Before commencing to milk any cow the hands of the person milking must be thoroughly washed and kept cleansed until the milking and handling of milk is finished for the time being." The provision of hot water, soap, nail-brush, and clean towel indicates the clean milker. Clean clothing must not be overlooked, and white overalls should be worn more frequently than they are. The milking-stool must be kept clean—a metal one with a hole for the hand in the seat is a good pattern. The practice of "wet" milking should not be tolerated. Dry milking is amongst the most important factors in clean milk production. Where machine-milking is employed very special attention must be directed to the cleaning of the machine and rubber parts. The method advocated is that known as "the boiling-water and caustic soda method," and has formed the subject of a departmental bulletin. Steam sterilization of cans and dairy utensils is an important item in dairy inspection.

The operations of cooling and straining the milk are carried out in the milk-house. The requirements regarding the construction of the milk-house have lately been under consideration, and it is proposed to embody certain structural requirements in an amended regulation. This refers to floor, walls, ceiling, ventilation, drainage, &c.

One of the most important details in the production of a pure milk-supply is proper cooling. A cooler, which is necessary for the rapid cooling of milk, is constructed so that the milk flows on a thin layer over a sheet of tinned metal while cold water flows on the other side of the metallic sheet and absorbs heat from the milk. Several types of milk-coolers are on the market. In some districts difficulty is experienced in the cooling of milk during the hot summer weather, when the water itself might be as high as 70° F. Under such conditions, some form of refrigerating plant is necessary. The bacterial count of milk is largely dependent on the manner and rapidity of cooling.

The practice of bottling milk at the farm has of recent years been on the increase. In many instances proper sterilizing apparatus for the sterilization of bottles has been installed, but in the majority of cases no such provision is made. The Department has had under consideration the desirability of making sterilization of bottles compulsory, and a regulation to this effect is about to be introduced.

Reference has already been made to bacterial testing, and other laboratory methods of testing milk, as an adjunct to dairy inspection. In England to-day certain standards are laid down in the Milk (Special Designations) Order. "Certified" milk must not contain more than 30,000 bacteria per c.c., and *B. coli* must be absent in every $\frac{1}{10}$ c.c. For "certified" milk the cows must be tuberculin-tested every six months until the herd is definitely free of reactors, when the test may be reduced to once a year. Grade A milk (tuberculin-tested) must not contain, at the time of delivery to the consumer, more than 200,000 bacteria per c.c., and *B. coli* must be absent in every $\frac{1}{100}$ c.c. In some districts in New Zealand, in co-operation with the Health Department, bacteriological counts of milks have been carried out, usually at hospital laboratories. The results are forwarded to the inspector of this Department, and afford him very valuable assistance in judging the manner in which the milk is being produced at the farm. In this connection it is desired to refer to the Gisborne milk-supply, where such examinations have been carried out for some years past, through the keen co-operation of the local medical officer of health with the departmental veterinarian in charge of dairy inspection at Gisborne. The results were indicated in a report some time back by the medical officer, which showed the existence in the Gisborne supply of a group of milkers supplying milk equal to the English "certified" standard. The practice has recently been introduced at Dunedin, and personally I should like to see its adoption in every centre.

The reductase test, in which methylene-blue solution and milk are mixed together, and the amount of reductase present, or the reduction power, indicated by the length of time required for the blue colour to disappear, is used as a general index of the bacterial content of milk and its keeping qualities. The reductase test is a valuable one when properly used for routine control purposes to detect the worst milk, but it has certain limitations which become more pronounced when attempts are made to use it at a high standard. It is known that the organisms which exert the greatest effect upon the test are the common milk streptococci (*S. lactis* types), while those germs such as coliform types, which are associated with dirty methods of milking and handling of milk, have a comparatively slight effect on the test. The standard of the Department of Health for the reductase test is three hours. Recently the question of extending this period to five hours has been under consideration. It is questionable, however, whether this would not be difficult to obtain in practice in some districts where difficulty is experienced in water-cooling in the hot, summer period. An extension, however, to 250 minutes might meet the position, and should be capable of being met by reasonable effort.

The question of pasteurization of milk is one upon which divided opinions exist. Whichever view is held, it must, however, be emphasized that efficient control of milk production on the farm is not affected. Pasteurization must never be regarded as an incentive to dirty methods of production. Probably the strongest argument in favour of pasteurization to-day lies in the elimination of danger of abortion infection from the milk-supply.

Dairy inspection is an exacting duty, calling for a degree of tact and the power to gain the confidence of the farmer on the part of

the inspector, apart from an intimate working knowledge of all the details connected with the production of milk for sale. Regarding the latter, it is held that the live-stock officer, on account of his specialized training, is the person pre-eminently suited to the performance of the duty, and the one who most readily secures the confidence of the dairy-farmer. The dairy inspector not only must see that certain regulations are complied with, but he has also an important instructional and advisory function to perform.

Finally, the viewpoint of the producer himself must be considered. Often is has been said that the most important factor in the successful production and handling of clean milk is the mentality of the worker. And this is perfectly true. How often does one see otherwise ideal conditions spoiled by the methods of a careless employee who is insanitary in his procedure? It is difficult, if not impossible, to inculcate ideas of clean milking and handling of milk in some people. The dairy-farmer cannot always be blamed personally for the neglect of his employees. It is his duty, however, to eliminate such carelessness, and it is towards this end that the practice of dairy inspection must always be directed. Let it be said that it is the endeavour of the majority of milk producers to produce milk of pure quality, and the primary object of regulatory control should be to assist in this achievement.

INVESTIGATION OF FEED-FLAVOUR IN BUTTER.

CORRELATION OF PASTURE TYPE AND STAGE OF GROWTH WITH INTENSITY OF FEED-FLAVOUR.

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As part of the policy of endeavouring always to obtain the highest possible quality in dairy-produce the matter of feed-flavour in butters has been the subject of a recent investigation. In this investigation, from the botanical point of view, some forty farms were visited and the pastures examined as to their botanical composition. Dominance of species was noted in respect to grasses, clovers, and weeds, and special attention was paid to stage and rate of growth and manurial practices followed.

Prior to the investigation many opinions were current as to the cause of feed-flavours in butters. It was contended—(1) That the type of pasture, particularly that induced by top-dressing, especially by superphosphate, was largely responsible; (2) that certain weeds and specific plants such as *Lotus major* were largely contributory to the trouble; (3) that it was largely a matter of dairy hygiene; (4) that it was not so much the class of food as the manner in which it was fed and the amount of scour it caused in the milking animal—*i.e.*, the problem was again one of dairy hygiene coupled with digestion troubles in the animal itself (the question of scour was specifically stressed in the matter of peat swamp land); (5) that the flavour might arise from the decomposition of butterfat by the action of ferments or enzymes which are present in all plants (these enzymes are held to break down the butterfat into fatty acids and glycerine, and it is the fatty acids that are held to cause the

taint and smell); (6) certain proprietary-manure interests have asserted definitely that superphosphate is to blame, and suggest that the remedy lies in the use of a non-acid manure made of rock-phosphate instead of superphosphate; (7) there is a very general agreement among Waikato suppliers that some modification of manuring methods, pasture, and herd management might succeed in lessening to some extent the strong feed-flavours.

It is obvious from the above opinions that a specific investigation into the whole question of food-flavours in butter was warranted.

The botanical investigation commenced early in September, and it soon became apparent that no specific weed in the pasture was responsible, the more weedy pastures in the early part of the season at least giving little or no feed-flavour, whereas the standard first-class pastures, dominantly rye-grass and white clover with little or no weed, gave the distinct characteristic feed-flavour in the cream.

A scheme for the testing and grading of cream was inaugurated by the manager of the Morrinsville Co-operative Dairy Co., Ltd., Mr. A. M. Stirling,* wherein the cream supplied night and morning from specially selected farms was subject to critical examination after its receipt at the factory and again the following day. Grading marks were allotted on a basis of 0 to 10, 0 meaning no feed-flavour and 10 the maximum of feed-flavour. Intermediate figures between 0 and 10 represented intermediate intensities in flavour. Bacterial count, or acidity, does not appear to be a factor affecting the incidence or intensity of feediness, but occasionally may confuse the issues. All creams classed as "off" or doubtful in purity were, however, excluded in assessing intensity of feediness of flavour.

Mr. Stirling was assisted in his grading by Mr. W. Dempster and Mr. E. Melton, of the Dairy Division of the Department of Agriculture. The whole of the investigation is under the direction of Professor W. Riddet, Director of the Dairy Research Institute.

At the outset of the investigation it was hoped that there might be a correlation between the dominant Waikato feed-flavour and specific plants, weeds, grasses, or clovers growing in the pasture, much in the way as it is reputed turnip-taint can be detected in the cream from cows fed on turnips.

In order to get this correlation between the characteristic feed-flavour and specific plants, my botanical assistant, Mr. E. A. Madden, who had had prior experience in cream-grading, spent some considerable time on the factory stage in acquiring the flavour under investigation. The feed-flavour, apart from a few odd exceptions, as, for example, that caused by hogscress and those due to bacterial contamination, proved to have a sameness that differed only in degree of intensity, and it was not possible to detect this flavour by masticating and tasting weeds, grasses, or clovers from areas known to give the characteristic flavour when fed on by the dairy cow.

Distillation of the more common plants would seem advisable, but this work must be done in such a way as to approximate as

* Mr. Stirling, by his enthusiasm and scrupulous care and attention to detail, has been largely responsible for the progress of these investigations to date. I especially wish to acknowledge this fact, and to thank also the directors of the Morrinsville Co-operative Dairy Co., Ltd., for their splendid co-operation.

near as possible the digestive processes of the animal itself. Some preliminary work by steam distillation has been done on several species by Mr. H. W. Boucher, B.Agr.Sc., on the staff of the Morrinsville Dairy Co., Ltd., but the results so far are not conclusive.

In the botanical surveys that were undertaken the following aspects were kept firmly in mind: (1) the botanical composition of the sward; (2) style of management and state and stage of growth when grazed by the herd; (3) the manurial practices adopted.

The Botanical Composition of the Sward.

From a practical point of view there are four major farm types in the Waikato, having regard to botanical composition:—

Farm Type 1.—Heavily manured farms, heavily stocked over a period of years, resulting in a highly-producing, early spring sward that is dominantly perennial rye-grass and white clover. Such pastures are luscious in the early spring—August to September—and are prone to produce feed-flavours during this early growing period. Evidence to date goes to indicate that such pastures "harden" fairly rapidly and become less prone to produce feed-flavours. This certainly was true over the present season, which, however, has been exceptionally dry.

Farm Type 2.—Moderately well manured and in process of building up to a high per-acre stocking, but not approaching type 1 in high concentration of stocking because of the fact that less fodder per acre is produced on this type. The swards are of moderately high production and fairly early away in the spring, but not so early as type 1 above. The sward is dominantly white clover with rye-grass rising subdominant excepting near gateways or night paddocks, where a high concentration of stock is secured. Here the rye-grass is dominant over white clover. Cocksfoot, *Poa pratensis*, and Yorkshire fog, with some sweet vernal and suckling clover in the weaker parts, are also present. These swards are prone to produce feed-flavours over a fairly long period, and the evidence to date strongly indicates that swards of the type 2 farms are more taint-giving during the October–November period than type 1, where the stubble growths of rye-grass running to seed-head appear to tend to reduce feed-flavours.

Farm Type 3.—Run-out swards or low-fertility soil types in the early stages of improvement by top-dressing, or where small quantities only of superphosphate or slow-acting phosphates are regularly applied. These swards are late away in the spring and carry an exceedingly low per-acre stocking. Such swards are dominantly suckling clover, sweet vernal, brown-top, and/or Danthonia, with some *Poa pratensis*, stunted Yorkshire fog, subterranean clover, and traces of white clover, rye-grass, and cocksfoot. During the present season such pastures produced feed-flavours late in the spring—end of October and November—and were, while the short flush lasted, the worst feed-flavour producing swards under investigation during the current season.

Farm Type 4.—Peat swamp country—these swards on the whole are weak in clover. They are essentially grassy swards, but many consist of poor types of grasses. The dominant species in the main are Yorkshire fog, brown-top, *Poa pratensis*, sweet vernal, with traces of rye-grass, cocksfoot, timothy, paspalum, and white clover. *Lotus major*

may be the dominant clover present. The better types may contain more cocksfoot, rye-grass, and paspalum, and the growth from Yorkshire fog is of a better quality; but the characteristic of peat swamps is largely their grassy rather than their clovery nature. Peat swamps throughout the investigation gave cream practically free of the characteristic feed-flavour. A short visit was paid to the Hauraki Plains, and several areas at Ngatea were examined. Those pastures on the whole are grassy, and top-dressing is the exception rather than the rule. The Ngatea pastures are renowned for producing a butter free of feed-flavours. Stock-scour, however, is often extremely prevalent on the Hauraki Plains, and it would appear that there is little or nothing in the assertion that scour is associated with feedy flavour in the milk or cream.

The relative intensities of "feedy" flavours from three of the above four farm types are set out in Table 1. The figures in this table are based on the averages of two gradings of night cream, one grading taking place at 3.30 p.m. on the day the cream arrives at the factory and the second grading at 8 a.m. in the following morning. In order to fix a basis for comparison and to deal with whole numbers rather than with decimals, 100 is arbitrarily taken to represent the strongest feediness met with in any individual grading. Actually the examination was made on an 0–10 basis as before explained. Farms of type 4 are not included, as these farms consistently show an almost entire absence of feediness. The number of farms in type 3 is small, and it is unfortunate that more of this type were not included in the investigation from the commencement. It can be taken, however, that at the commencement there was little or no feediness in the cream of the farms from this type, and it was not until a strong feediness was detected that these farms were included in the analysis. Moreover, all the farms examined are not included in the table, for the reason that several were dropped out and others substituted in the course of the trial, and in some instances it was not possible owing to variations of sward from paddock to paddock and to differing soil types to classify particular farms in any of the farm types enumerated. Even as it is, there is no hard-and-fast dividing line between the farm types, and certain included in, say, type 1 have paddocks that should be included in type 2, and certain of type 2 have paddocks that should be in type 1 or 3. The type 3 farms also have odd paddocks, particularly about the homestead, that should be in type 1 or 2. It can be fairly definitely stated, however, when it comes to the period commencing 20th October, that the feediness figure indicates poorness in sward type—the higher the degree of feediness the poorer the sward. This refers purely to the farm types as set out in the table. It does not include peat farms, and it is known to be true only for the year under review.

A rather interesting confirmation of the above conclusion took place during a short period of investigation at Cambridge on the 7th November. The cream of four suppliers was graded on the stage at the factory of the Cambridge Co-operative Dairy Co., Ltd. Three lots of cream were showing a high feed-flavour, and one was comparatively mild. The mild cream was from a good rye-grass white clover dominant sward, approaching type 1 farm; and the intensely "feedy" creams were from low-production farms of the 2–3 type. One of these, bordering on a type 3 farm, had not been top-dressed for years. It was dominantly white clover, suckling clover, sweet vernal, with much brown-top and some weak rye-grass.

Table 1.- Showing Individual Farms classified according to Pasture Type, together with Feed-flavour Intensities of Night Cream for each Type over Specific Ten-day Periods.

(100 = very strong feediness ; 0 = no feediness. The letter at the head of each column is the supplier's identification letter.)

Period.	Farm Type 1.										Farm Type 2.											Farm Type 3.			
	A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.	Average.	T.	U.	V.	Average.
10–19 September ..	..	36	39	54	40	41	25	58	38	41·4	..	57	44	32	54	61	..	30	..	..	47·8	..	..	..	..
20–29 September ..	4	5	5	7	7	21	7	25	16	10·8	..	6	20	3	13	10	..	28	..	..	14·8	..	..	..	..
30 September–9 October..	5	8	..	15	3	2	15	30	21	12·4	..	22	22	22	30	25	..	40	..	..	27·8	..	..	..	..
10–19 October	6	20	..	7	10	11	30	31	30	18·6	..	40	38	40	45	43	..	30	..	..	39·3	..	..	..	..
20–29 October	23	20	20	22	21	18	22	33	37	24·0	33	30	33	26	39	47	26	37	43	28	34·8	40	..	65	52·5
30 October–8 November..	26	23	15	..	4	12	20	20	34	10·2	52	42	38	38	46	43	34	46	46	40	42·5	38	..	60	49·0
9–19 November.. ..	6	5	0	3	0	0	8	20	32	8·2	46	19	28	32	28	34	20	40	36	32	31·5	33	..	30	31·5
20–29 November ..	6	12	0	2	8	0	9	20	17	8·2	33	11	1	18	21	31	10	16	23	9	17·3	35	33	27	31·6
30 November–9 December	8	27	..	..	15	0	16	27	8	14·4	30	..	0	23	6	18	14	32	13	18	17·8	24	33	14	35·5
10–19 December ..	10	5	0	5	0	1	1	3	10	3·9	12	4	0	3	0	1	1	5	0	3	3·5	4	0	1	1·6

Table 2.- Showing Individual Farms classified according to Pasture Type, together with Feed-flavour Intensities of Morning Cream for each Type over Specific Ten-day Periods.

(100 = very strong feediness ; 0 = no feediness. The letter at the head of each column is the supplier's identification letter.)

Period.	Farm Type 1.										Farm Type 2.											Farm Type 3.			
	A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.	Average.	T.	U.	V.	Average.
10–19 September ..	..	10	15	20	0	0	8	22	14	11·0	..	8	5	8	7	15	..	3	..	..	7·7	..	..	..	..
20–29 September ..	0	2	0	0	0	1	0	5	1	1·0	..	2	2	1	0	2	..	1	..	..	1·3	..	..	..	..
30 September–9 October..	0	4	..	4	0	0	1	4	0	1·6	..	0	0	3	3	3	..	4	..	..	2·2	..	..	..	..
10–19 October	5	11	..	0	0	6	7	4	2	4·4	..	7	23	4	20	18	..	2	..	..	12·3	..	..	..	..
20–29 October	7	15	12	14	9	12	10	9	15	11·4	15	14	20	15	22	23	2	14	10	12	15·9	13	..	20	10·5
30 October–8 November..	7	5	3	..	2	0	2	2	17	4·7	23	22	23	10	24	23	3	15	16	20	17·9	22	..	9	15·5
9–19 November.. ..	1	3	1	0	0	0	0	2	1	0·88	13	5	16	2	8	10	0	6	2	12	7·4	5	..	3	4·0
20–29 November ..	3	3	0	2	8	0	2	2	1	2·3	5	2	1	1	2	7	1	2	3	1	2·5	1	13	1	5·0
30 November–9 December	0	5	..	..	1	0	7	11	2	3·7	11	..	3	4	0	10	0	3	15	4	6·2	3	17	6	8·6
10–19 December ..	0	0	0	0	2	0	0	0	0	0·22	0	4	0	0	0	1	0	0	0	0	0·5	0	1	0	0·3

Management of Pasture, State and Stage of Growth when eaten.

The contention among the farmers of the Waikato that pasture and herd management might succeed in lessening to some extent the strong feed-flavours seems to be substantially correct.

That there is something in herd management is clearly indicated by an examination of morning cream compared with the night cream from the same herd and shed, and often from the same pastures.

These comparisons between night and morning cream may be readily seen by a comparison of Table 2 and Table 1. Both these tables are set out on exactly the same basis, and it is consistently shown that the night cream is often strongly feedy, and the morning cream is comparatively mild. The average figures show a ratio of approximately 1–3½ throughout the main feeding periods, the night cream being actually 3·6 times as feedy as the morning cream throughout the same feeding periods of the season under review. There was no material increase in feed-flavour intensity with ageing of the cream. The fact that morning cream is less feedy than night cream does not support the opinion that enzymes or ferments are responsible for feed-flavour if it is correct that at night the plant tissues contain large amounts of these ferments and during the day the ferments are practically absent.

Some observations on the feeding habit of the dairy cow made by the writer may serve to throw some light on the reason for this difference between night and morning milk, and it is apparently largely influenced by the grazing habit of the cow at night as compared with day in relation to the amount consumed and the nearness or otherwise to milking-time that food is eaten. It is well known that if taint-producing feeds like turnips, cabbage, green lucerne, &c., are fed shortly prior to milking, bad feed-flavours develop; whereas if these are fed immediately after milking little or no taint is observed. The findings of the American work in this respect, particularly those of Dean,* Gamble and Kelly,† and Babcock,‡ go to show that if taint-producing feeds are fed at from four to five hours prior to milking little or no taint is produced. If we regard young, luscious, quickly-growing pasture as being a taint-producing food, then the time of eating of this prior to milking will have a very decided influence in the feediness or otherwise of the milk or cream produced. It was ascertained that little or no grazing is done by a well-fed dairy herd between the hours of 1 a.m. and milking-time. The following gives a very good idea of the night-time grazing of the herd:—

Time (p.m.) ..	7.0	7.30	8.0	8.30	9.0	9.30	10.0	10.30	11.0	11.30	12.0
Number grazing ..	73	67	20	0	0	0	0	33	42	32	15
Number standing about	3	9	8	19	10	3	18	29	24	28	44
Number lying down ..	0	0	48	57	66	73	58	4	10	7	17

Time (a.m.) ..	12.30	1.0	1.30	2.0	2.30	3.0	3.30	4.0	4.15
Number grazing ..	11	6	4	4	1	3	3	0	All
Number standing about ..	37	20	13	2	3	15	7	4	at
Number lying down ..	28	50	59	70	72	58	66	72	shed.

The nights on which the above observations were made were dark, and counts were made every half-hour by means of an electric

* Dean, H. H.: Experimental Farm Reports, *Ont. Ag. Coll.*, 1897; p. 59.
† Gamble, J. H., and Kelly, E.: *U.S. Dept. Ag. Bulletin*, 1097.
‡ Babcock, C. J.: *U.S. Dept. Ag. Bulletin*, 1190, 1208, 1297, 1326, and 1342.

spot-light run off the battery of the car, which was drawn up in the centre of the paddock. The herd under observation was of seventy-six cows, and only those cows standing up or grazing were actually counted.

A further observation was made on a bright moonlight night, when the number of cows grazing between 1 a.m. and milking-time was somewhat larger than on a dark night.

Observations made on a moonlight night with moon just past its full, bright and clear, in a herd of seventy-six cows were:—

Time (a.m.)	12.30	1.0	1.30	2.0	2.30	3.0	3.30	3.45
Number grazing ..	6	15	7	4	9	6	8	All cows
Number standing about ..	18	5	2	2	3	5	6	assembled
Number lying about ..	52	56	67	70	64	65	62	at shed.

These observations go to show there is comparatively little grazing done between midnight and milking time in the morning, and this may have an important significance when coupled with the mild feed-flavour of the morning's cream as compared with night cream.

It brings up the question whether it is possible to manage the dairy herd in such a way that the luscious early spring growth is rationed so that the herd is off it and on non-luscious feed four to five hours prior to milking in the evening. The fact that the dairy herd automatically rations itself at night also points rather to the possibility of using the early luscious feed as night grazing rather than as day grazing as at present. A fairly standard practice at present is to put the cows in the day on to the young fresh luscious feed and then at night to put them on to harder feed, with or without hay or ensilage. Later on in the season the herd may at night have the run of day paddocks after these have been used as day paddocks for one or more days.

Another practice is to use special night paddocks regularly night after night. In all these practices the tendency is to graze fresh luscious feed by day and non-luscious or essentially grassy feeds by night. In view of the fact that the herd automatically rations itself by night it would appear sound as regards feed-flavour control to reverse this practice, giving the herd access to the more luscious feed after milking at night and the less luscious during the day, and particularly from mid-day until milking-time in the evening.

During the course of the investigation some attempts were made to ration the herd on several farms from mid-day onward, but the season was so erratic in respect to feedy flavour as to make these trials of little value. In addition, attempts to ration were made late in the season when hay and ensilage supplies were exhausted and when there were no special paddocks prepared for the purpose. Rationing under the above conditions was not wholly satisfactory, but none the less some slight improvement in the night cream was effected. It would appear that rationing in the case of the type 1 farms is essentially sound and practicable, because the trouble in the case of these farms comes early in the season when supplies of

hay and silage are still on hand. In the case of type 2 farms the trouble is more extended, and in the case of type 3 farms it comes so late that no hay or ensilage remains.

There seems to be little doubt that clovery pastures are essentially worse in causing feed-flavours than grassy pastures. This may be seen in comparing type 1 farms with types 2 and 3. The former are essentially grassy, or they have more paddocks that are essentially grassy, than is the case of farm types 2 and 3, the reason for which is explained later.

It would appear, if rationing is an essential to reduce feed-flavour in night creams, that an earnest endeavour should be made to get certain pastures on the farm more grassy, or to make more use during the day of the more grassy "night" paddocks than is made at present. If each farm had two or three essentially grassy paddocks that are let get away somewhat long, and if these are used from, say, 11 a.m. to milking-time in the evening, then there is a fair possibility of the feed-flavour problem in the night milk being considerably reduced.

Newly laid down paddocks are essentially grassy, and if these are sown with certified rye-grass, cocksfoot, and paspalum, with a small amount of clover, they may be kept grassy for years by periodic dressings of sulphate of ammonia or ammoniated super. It is essential in following out such a practice to have the land well limed before using sulphate of ammonia either alone or in the form of ammoniated super. Nitrogenous manures are essentially grass-promoting, whilst phosphate, potash, and lime encourage clover rather than grass.

Type 1 farms are essentially grassy in virtue of the high per-acre stock-carrying capacity, as a result of which large quantities of quickly available nitrogen in the form of urine and dung are being applied regularly, and it is considered that when a farmer obtains a carrying capacity in the vicinity of one dairy cow per acre or a little better the farm definitely becomes grassy, and this offers the best final solution to the feed-flavour problem in the Waikato. It must be borne in mind that large areas of New Zealand are literally made by phosphate and stock, and in the making of these pastures the swards are essentially clovery—it may, in the early stages, be suckling clover or subterranean clover, or red clover in newly-sown pastures, and, later on, white clover associated with more or less grass according to the stock-nitrogen excreted by the grazing animal. In contradistinction to this phosphate-made country, naturally fertile country is essentially grassy rather than clovery, and in this the feed-flavour is not so acute. The Waikato soils are essentially light and pumiceous. They increase in warmth in the spring exceedingly rapidly, and when provided with adequate moisture give a remarkably early and luscious growth, and it would appear that there is something in the newly-formed rapidly multiplying tissues of the plant that is decidedly prone to cause taint in milk, and in this stage grass as well as clover may be contributory. The grassy swards, however, tend to mature and harden earlier than the clovers, and this hardening has a marked reducing effect on the taint-producing propensities of the herbage. Thus the type 1 farms are less prone to taint than the more clovery type 2 and 3 farms, particularly when the feed has hardened up somewhat.

There is another practice that may tend to reduce feed-flavour. It has been noted that certain farms approaching type 1 in pasture composition are worse than others. On these farms there is a tendency to keep the pastures shorter, either out of necessity or on the assumption that short, ever-growing fresh feed has a higher milk-producing value. The practice of keeping the sward short tends to encourage clover rather than grass and to produce greater quantities of young, vigorously growing leaf rich in protein, and these two factors appear to intensify feed-flavours. In three of the No. 1 type of farms particularly—*i.e.*, A, B, and E—there was shown a tendency to allow the swards to "get away" somewhat more markedly than the average, and this practice, whilst counter to the modern concept of pasture-utilization in the young luscious stage, still does appear to be a move in the right direction as far as quality products are concerned, particularly in an area where feed-flavours are strong. Allowing the pasture to develop more height—up to the 6 in. to 8 in. stage—operates in three ways: (1) Grasses are encouraged; (2) clovers are suppressed; (3) the herbage is older and more hardened.

The hardening of the pasture and consequent ageing of the leafage appears almost entirely to correct feed-flavours. This was noted particularly during the investigation as soon as a week or so of dry weather intervened between rains. In Table 1, for example, the period 10th–19th September followed rain, and the period 20th–29th September was dry. Actually rain fell from the 24th to the 29th, but this did not affect this period appreciably. Following the rains of the 24th–27th there occurred cold south winds that undoubtedly checked growth considerably. Feed-flavours continued to be comparatively mild until warm rains fell in the period 10th–19th October, when there was a decided increase, which, however, was again checked by cold weather a few days later. In the period ended 8th November mild seasonable weather with occasional showers was experienced, and this tended to increase feed-flavours in types 2 and 3 farms, as a result no doubt of fresh clover growth. In farms of type 1 during this period the rye-grass was starting to produce flower-heads, and even though fresh clover growth was made in those pastures the hardening of the rye-grass checked the rise of feediness on these type 1 pastures. In the period 9th–19th November the weather was hot and dry, and again intensity of feediness commenced to fall. The weather continued hot and dry with the exception of a light rain at the end of the foregoing periods, and this is reflected in a general drop in feediness, which then remained mild up to Christmas, when practically no feediness was manifest. Throughout these trials it is obvious that feediness is governed by weather conditions, and unless the weather is such as to promote rapid growth, particularly in clovers, no feediness is apparent. It is safe to state, therefore, that young, fresh, quick-growing growth, particularly in clovers, is largely responsible for feediness, and that once the plant ages, or is fed in conjunction with more hardened feeds, feediness declines. In order to test experimentally the effect of two classes of pasture, the following trial in collaboration with the Dairy Research Institute was inaugurated at Palmerston North.

Four cows were selected and grazed together for three days on a control paddock, the milk and cream being graded for flavour night and morning as at Morrinsville.

Two cows were then placed on pure rye-grass for four days, and two were placed on rye-grass and white clover, the clover being dominant. After the four-day period the cows were again placed together in the control paddock and were then again grazed on the pure rye-grass and rye-grass white clover; the cows that were on the rye-grass white clover during the first period being now put on to the pure rye-grass and those that were on the pure rye-grass were put on to the rye-grass white clover. The results of this trial are indicated in Table 3, and the figures show that the rye-grass white clover pasture tended to cause feediness whilst the pure rye-grass and the control paddocks, which were essentially non-luscious grassy swards, caused little or no feediness. The second period on the special feeds showed a much reduced feediness as compared with the first period, and this may be due to the fact that the rye-grass-clover sward had hardened somewhat, or it may have been due to the individuality of the cows.

Table 3.—Grazing Trial at Palmerston North showing degree of Characteristic Feediness when Cows are grazed on different Classes of Pastures.

(Points: 100 = very strong feediness; 0 = no feediness.)

—	Morning Cream.	Night Cream.	—	Morning Cream.	Night Cream.
Control Feed, Cows 1 and 2.			*Control Feed, Cows 3 and 4.*		
5/10/34 ..	0	0	5/10/34 ..	0	0
6/10/34 ..	0	0	6/10/34 ..	0	0
7/10/34 ..	0	0	7/10/34 ..	0	0
8/10/34 ..	0	..	8/10/34 ..	0	..
Rye-grass Pure, Cows 1 and 2.			*Rye-grass and White Clover, Cows 3 and 4.*		
8/10/34 ..	..	0	8/10/34 ..	..	50
9/10/34 ..	0	0	9/10/34 ..	10	40
10/10/34 ..	0	0	10/10/34 ..	10	40
11/10/34 ..	0	0	11/10/34 ..	5	35
12/10/34 ..	0	..	12/10/34 ..	30	..
Control Feed, Cows 1 and 2.			*Control Feed, Cows 3 and 4.*		
12/10/34 ..	..	0	12/10/34 ..	..	0
13/10/34 ..	0	0	13/10/34 ..	0	10
14/10/34 ..	0	0	14/10/34 ..	0	0
15/10/34 ..	0	..	15/10/34 ..	0	..
Rye-grass Pure, Cows 3 and 4.			*Rye-grass and White Clover, Cows 1 and 2.*		
15/10/34 ..	..	0	15/10/34 ..	..	0
16/10/34 ..	0	0	16/10/34 ..	0	5
17/10/34 ..	0	0	17/10/34 ..	0	20
18/10/34 ..	0	0	18/10/34 ..	0	0
19/10/34 ..	0	..	19/10/34 ..	0	..
Control Feed, Cows 3 and 4.			*Control Feed, Cows 1 and 2.*		
19/10/34 ..	..	0	19/10/34 ..	..	0
20/10/34 ..	0	0	20/10/34 ..	0	0

The Waikato experiments suggest that hardening of the herbage was largely responsible for the diminution of feediness in the second period of the trial on the special feeds.

The trials at Palmerston North were not very refined, and the results must be taken as only an indication rather than as conclusive. The whole question of nutritional effects of feeds used, with their influence on quality of animal-products, needs careful investigation on a well-planned and refined basis.

The Manurial Practices adopted in relation to Feediness.

There is a widespread feeling that top-dressing with phosphate is directly or indirectly the main cause of feediness. It has been pointed out that feed-flavour in cream is apparently due largely to the clover when this is in a rapid stage of growth. It may be suckling clover, subterranean clover, red clover, or white clover. In the case of certain farms where suckling clover is dominant little or no top-dressing has been applied during the last five years; therefore top-dressing cannot be blamed for feed-flavours in those instances, and yet the taint is identical with that secured on heavily top-dressed farms. Nevertheless it is obvious that top-dressing with phosphate, potash, and lime intensifies feediness in proportion to the growth of clover that such manures encourage, and it appears that the value of a phosphatic manure is relative to the clover growth it promotes. If certain phosphatic manures do not increase feedy flavour in the early stages of pasture improvement in such soils as the Waikato, then they can be discarded. There has been an increase in the use of superphosphate, which is the main fertilizer used in the Waikato, and there has undoubtedly been a marked increase of feediness, a sure indication that superphosphate is doing its job of increasing production. Some farmers to-day, seeing this increase of feediness, are hesitant about applying more superphosphate and tend to look for other fertilizers or to reduce the use of superphosphate. This is bound merely to increase feediness and to result in loss of production, and it will prolong the time of transition from the clover-dominant to the grass-dominant phase. If Table 1 is examined, the results of a skimpy, hesitant policy in regard to the use of superphosphate, as against that of the heavy top-dressing, are seen. Farms of type 3 receive scarcely any top-dressing at all, and if the percentage of feedy cream in relation to the yearly output were worked out it would be in relation to the whole output far in excess of farm types 1 and 2. The owners of farms of type 2 may be regarded either as hesitant relative to superphosphate and those who have been changing over to more slowly acting phosphates or ones who are in the throes of "top-dressing through" the clovery phase. The owners of farms of type 1 are definitely heavy users of top-dressing, and in addition to superphosphate may have used lime, potash, or basic slag, but superphosphate has been the basis of their manurial top-dressing. Their production has risen enormously, and they are amongst the highest per-acre producers in the Waikato. Their paddocks are becoming essentially grassy and the feed-flavour problems develop early in the spring, when it is considered a good farming practice to ration the young spring grass with hay or ensilage. These men are now in a position to make several of their paddocks dominantly rye-grass by the use of ammoniated super, and are in a position to allow one or more paddocks to get away somewhat more rank for specific rationing purposes along with the more clovery fields

that, if fed alone, would give trouble. However we view the top-dressing practice in the Waikato or elsewhere, the fundamental fact remains that the more stock we can carry per acre and the better we can feed that stock the more grassy will the sward become as a result of the essential nitrogen returned to the sward by the grazing animal itself. Artificial nitrogen may help us out in getting to this ideal quickly in the Waikato, but it has been proven that it can be done with quick-acting superphosphate, with or without lime and potash.

Weeds in relation to Feediness.

As far as the major problem of feediness in the Waikato is concerned, over the area investigated at least, weeds can be eliminated as a source of the main trouble. The most common weeds of the Waikato are catsear (*Hypochaeris radicata*), and rib-grass (*Plantago lanceolata*). Scotch thistle (*Cnicus lanceolatus*), Californian thistle (*Cnicus arvensis*), Selfheal (*Prunella vulgaris*), Dandelion (*Taraxacum officinale*), cudweed (*Gnaphalium luteo-album*), field daisy (*Bellis perennis*), hawkbit (*Leontodon hispidus*), Hawkweed (*Crepis virens*) are common. Rush (*Juncus* spp.), buttercup (*Ranunculus sardous* and *R. repens*), dock (*Rumex* spp.), greater plantain (*Plantago major*), and pennyroyal (*Mentha pulegium*) are prevalent in the wetter soils, and the lesser spearwort (*Ranunculus flammula*) is common in wet water-logged areas. For the most part these weeds are common to all farms and are in greater numbers, and contribute more to the total feed consumed on farms where feed-flavours are mild.

Certain specific weeds such as hogcress (*Senebiera didyma*), popularly known as land cress in the Waikato, pennyroyal, watercress, &c., are said to impart characteristic feed-flavours in the cream, but these can be detected apart altogether from the characteristic feed-flavour under investigation.

In regard to hogcress, this is essentially a weed of newly sown pastures or of pastures where the turf has been broken by the ravages of grass-grub or by smother through the dumping of shed refuse. One is diffident to advise the breaking-up of pastures in those areas where hogcress is likely to be bad, but unless good strains of rye-grass and white clover were originally sown it is better to risk hogcress for the first year rather than waste time and fertilizer in attempting to repair swards that are too poorly constituted to respond. Ploughing and resowing with good strains and maintaining the newly sown sward by top-dressing are likely to lead to a grassy sward much more quickly than repairing a weak pasture by top-dressing.

Conclusion.

The suggestions outlined in this report offer no explanation of the actual factor or factors responsible for feediness. The explanation is probably wrapped up in the complexities of chemical changes associated with very rapid growth—rapid formations of carbohydrate materials; transformation of these to soluble sugars by ferments; the rapid absorption of nitrogenous and mineral compounds and the chemical reactions in the formation of proteins of which young growth is rich. There may be a specific material responsible for feediness, and if this

is so, and it could be isolated, some direct counter attack might be possible, but in the meanwhile it would appear that control or diminution of feediness largely rests in adoption of the following practices:—

(1) Every endeavour should be made to make pastures grass-dominant rather than clover-dominant. Heavier manuring with quickly acting phosphates such as superphosphate with occasional dressings of ammoniated super and lime is recommended, and, where pastures are "run-out," ploughing and resowing to certified strains of grasses and clovers is advised rather than top-dressing the deteriorated pastures, as the latter practice must inevitably mean up to three years of clover-dominance, whereas ploughing and resowing gives grass-dominance the first year.

(2) The more clovery feeds should be grazed after milking rather than from three to four hours prior to milking, and some consideration should be given to the class of feed given during the day as against that at night, tainting at night being less pronounced even when on the same class of feed—sometimes the same paddocks as a result of the cow grazing mainly prior to midnight.

(3) To permit of the foliage hardening to some extent, pasture-herbage, during periods of rapid growth, should be allowed to grow to a somewhat more mature stage before grazing. The mowing of clovery swards and the feeding of these in the wilted stage may also be effective, if practicable.

TESTING OF PUREBRED DAIRY COWS.

REVIEW OF THE NEW ZEALAND CERTIFICATE-OF-RECORD SYSTEM IN 1934.

W. M. SINGLETON, Director of the Dairy Division, Wellington.

FIRST-CLASS certificates-of-record were issued to 637 cows in 1934, as compared with 507 cows in 1933, an increase of over 25 per cent. The figures for 1932, 1931, and 1930, were 486, 737, and 643 cows respectively. In view of the considerably reduced incomes of breeders during the past five years on account not only of the low level of butterfat returns, but also of the diminished prices offering for pedigree dairy stock, the general position is very satisfactory. It points to a realization on the part of breeders of the value and importance of testing, and a willingness to make financial sacrifices in order to maintain continuity of butterfat records. The wisdom of this attitude is obvious to any one who is conversant with the advantages of authenticated dairy-cow yields, but it is gratifying to those who control the C.O.R. Test to know that the system has the support of so many of our breeders of purebred dairy cattle.

Of the 637 cows which received first-class certificates last year, 534 were in the yearly-test division and the remaining 103 in the 305-day division. The comparative figures for 1933 were 461 and 46 respectively, so that the ten-months class experienced an increased support to the extent of over 100 per cent.

(1) C.O.R. YEARLY TEST DIVISION.

Although the number of cows qualifying for first-class certificates in the yearly division during the period under review was 534, the number of certificates represented was 536, the difference of two being accounted for by the fact that two cows each received two certificates during the year. The 536 certificates represented an average production of 527·45 lb. butterfat, an increase of 4·35 lb. over the 1933 average of 523·10 lb. fat for 461 certificates. It is pleasing to note an increase in average production running hand in hand with an increase in number of cows.

First-class Certificates issued.

Cows which have been granted first-class certificates since the inauguration of the C.O.R. system in 1912 now number 9,019. Subdivided into breeds this total represents 6,561 Jerseys, 1,720 Friesians, 443 Milking Shorthorns, 218 Ayrshires, 68 Red Polls, 2 Guernseys, and 7 Shorthorns. Table 1 provides a numerical summary of yearly certificates of the first-class issued during the past two years:—

Table 1.

Breed.	1934.			1933.		
	Ordinary.	Repeat.	Total.	Ordinary.	Repeat.	Total.
Jersey	415	41	456	337	35	372
Friesian	41	18	59	54	15	69
Milking Shorthorn ..	9	3	12	11	1	12
Ayrshire	2	..	2	5	..	5
Shorthorn ..	..	..	..	1	..	1
Red Poll	6	1	7	..	2	2
Totals ..	473	63	536	408	53	461

Second-class Certificates issued.

Only two breeds were represented in this class, 35 second-class certificates being issued to Jerseys and 1 to a Milking Shorthorn, making a total of 36, in comparison with 37 for the previous year. The average production of the 35 Jerseys was 516·90 lb. butterfat, while the Milking Shorthorn cow was credited with 508·61 lb. fat.

Third-class Certificates.

During the past year 193 third-class certificates were issued to Jerseys, 17 to Friesians, and 2 to Milking Shorthorns, one cow in the Jersey breed receiving certificates on two separate performances. The average for the Jerseys was 497·20 lb. fat from 8,818·6 lb. milk in 353 days, for the Friesians 565·16 lb. fat from 15,834·3 lb. milk in 330 days, and for the Milking Shorthorns 600·17 lb. fat from 14,144·1 lb. milk in 365 days. While there were several good performances among these third-class certificates none were sufficiently outstanding to warrant particular mention.

Period between Calvings.

The average period between calving for commencement of test and calving subsequent to test for the 534 cows granted first-class

certificates during the year was the same as for the preceding twelve-month, namely, 403 days. The corresponding period for the second-class cows was 463 days, as compared with 467 days for the preceding year. Seeing that the maximum period allowed for calving for first-class C.O.R. is 455 days, it is obvious that those cows which fail to qualify for this class are doing so by a very narrow margin, and, moreover, that breeders are endeavouring to have their cows calve within the period specified by the rules for first-class C.O.R.

Jerseys.

Class Leaders.

Although each time there is occasion to make a change in the list of class leaders for any breed it is felt that probably several years will elapse before any of the existing records are superseded, it is remarkable how each year seems to produce a new champion in one or other of the classes. This year's alteration occurs in the Jersey breed and in the Junior Two-year-old class. The new leader is Beechlands Summer Lass, while Greencroft Golden Grace is the cow which is displaced. Beechlands Summer Lass was bred and tested by Messrs. A. Moreland and Sons, Te Rapa, and, as will be seen from Table 2, gained her certificate for the phenomenal performance of 899·25 lb. fat. This yield is all the more remarkable when it is considered that she calved for commencement of test at under two years of age, and that she was milked only twice daily during her entire testing period. The record of Mr. J. Bones's Greencroft Golden Grace was 864·61 lb. fat from 14,678·4 lb. milk on a test commenced at two years eighteen days. This was on three times a day milkings. The Jersey class leaders are as follows :—

Table 2.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Beechlands Summer Lass	A. Moreland and Sons, Te Rapa	1 343	275·5	365	15,467·2	899·25
Senior Two-year-old.						
Ivondale Golden Rainbow	P. J. Petersen, Waitara	2 311	271·6	365	12,962·2	768·46
Three-year-old.						
Ivondale Silver Rainbow	P. J. Petersen, Waitara	3 327	309·7	365	15,073·4	950·63
Four-year-old.						
Woodlands Felicie	P. J. Petersen, Waitara	4 364	384·9	365	17,332·6	1,220·89
Mature.						
Holly Oak's Annie..	W. T. Williams, Pukehou	5 9	350·0	365	18,522·7	1,056·49

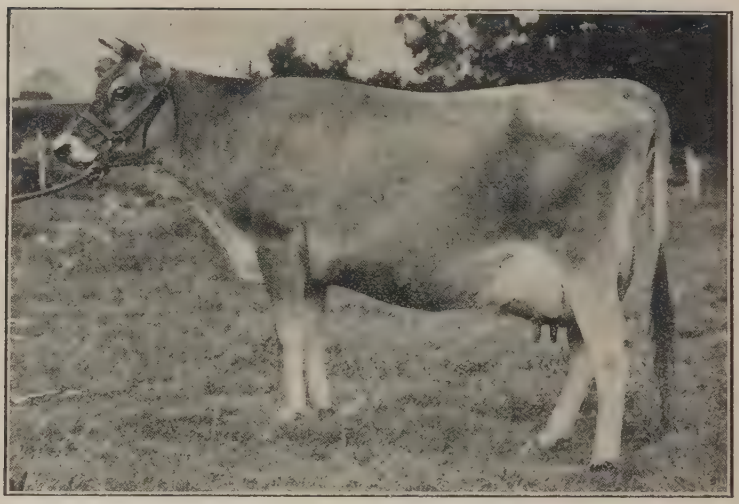

FIG. 1. BEECHLANDS SUMMER LASS (A. MORELAND AND SONS, TE RAPA).

New class leader in junior two-year-old class: 15,467·2 lb. milk, 899·25 lb. butterfat. [*N.Z. Farmer photo.*

FIG. 2. MAORI JUDY (MRS. G. E. O'SULLIVAN, INGLEWOOD).

Highest C.O.R. Jersey, 1934, in senior two-year-old class: 13,114·7 lb. milk, 714·29 lb. butterfat.

Jersey Class Averages.

The average production represented by all Jersey certificates issued in the yearly division during the year was 518·02 lb. fat, an increase of 4·93 lb. over the 1933 average of 513·09. In view of the fact that the number of certificates issued for this breed rose from 372 in 1933 to 456 in 1934, the breeders concerned have reason to be proud of their achievement. Taking the classes individually, the junior two-year-olds and the three-year-olds both showed a substantial increase in average yield, while the remaining classes declined. The detailed position may be noted from Table 3, in which the class averages for 1934 and 1933 are given.

FIG. 3. RESHURE FLIRT (H. S. FLEMING, CLEVEDON).

Highest C.O.R. Jersey, 1934, in three-year-old class: 11,444·4 lb. milk, 751·56 lb. butterfat.

[*N.Z. Farmer photo.*

Table 3.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1934.		lb.	lb.
Junior two-year-old ..	188	360	8,246·7	473·65
Senior two-year-old ..	46	356	8,442·2	492·32
Three-year-old	60	359	9,439·1	540·59
Four-year-old	47	355	9,868·9	566·31
Mature	115	355	10,239·6	569·31
	1933.			
Junior two-year-old ..	150	358	7,868·3	449·63
Senior two-year-old ..	44	356	8,931·5	500·61
Three-year-old	56	358	9,415·3	524·62
Four-year-old	43	354	10,613·7	602·26
Mature	79	358	10,487·8	583·83

The averages, class by class, of all certificates issued to Jersey cows since the commencement of the C.O.R. system in 1912 are given in Table 4:—

Table 4.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	2,947	348	7,192·0	404·46
Senior two-year-old ..	786	346	7,875·2	445·29
Three-year-old	1,093	345	8,600·0	481·16
Four-year-old	757	347	9,194·5	513·24
Mature	1,810	347	9,529·5	524·44
All	7,393	347	8,250·1	460·65
Average test, 5·58.				

Jersey C.O.R. Bulls.

The names of 2,391 different sires now appear on our Jersey lists, and of these, 472 have qualified for the C.O.R. class. A bull is classed as a C.O.R. bull when he has four or more daughters with first-class certificates, each daughter being from a different dam. Twenty-eight bulls have now qualified for the Jersey Cattle Breeders' Association's champion butterfat bull class, the qualifications for this class being as follows: Each bull must have five or more daughters which under first-class C.O.R. conditions have produced 520 lb. butterfat when starting test up to three years of age, 580 lb. when starting between three and four years of age, 640 lb. when starting between four and five years of age, or 700 lb. when five years old or over. It is not necessary for each daughter to be from a different dam. (The corresponding standards for cows in the 305-day test are 460 lb., 510 lb., and 620 lb. butterfat respectively.)

Friesians.

Class Leaders.

There were no changes in Friesian class leaders during the year. There were, however, a number of outstanding performances, one worthy of special mention being that of the Piri Land Co.'s remarkable producer Totara C.R. Buttercup. During the year this cow gained a certificate for 28,073 lb. milk containing 1,050·07 lb. fat, which makes two successive performances exceeding 1,000 lb. fat. Her individual records to date are as follows:—

Age.	Days.	Milk.	Fat.
Yrs. dys.		lb.	lb.
2 205	365	21,208·6	790·66
3 247	365	25,885·3	989·10
4 267	365	27,108·1	1,079·14
5 308	365	28,073·0	1,050·07
Average ..	365	25,568·7	977·24

Totara C.R. Buttercup is again on test, though the parched conditions are exerting their toll, and she will not measure up to her average for the past four seasons. Nevertheless, if she continues in good health Totara C.R. Buttercup will make history from the point of view of long-distance performance. From the point of view of individual records she still holds the leading position in the senior three-year-old and the senior four-year-old classes. The Friesian class leaders are now as shown in Table 5 below.

FIG. 4. TOTARA C.R. BUTTERCUP (PIRI LAND CO., AUCKLAND).
See text for details of outstanding performance.
[*Dairy Exporter photo.*

Table 5.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	2 16	242·1	365	20,501·1	740·50
Senior Two-year-old.						
Pareora Echo Blossom	T. Sheriff, Clandeboye	2 223	262·8	365	22,671·9	819·81
Junior Three-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·3	800·18
Senior Three-year-old.						
Totara C.R. Buttercup	Piri Land Co., Auckland	3 247	336·7	365	25,885·3	989·10
Junior Four-year-old.						
Totara Veeman Lulu	Piri Land Co., Auckland	4 12	349·7	365	22,364·2	946·78
Senior Four-year-old.						
Totara C.R. Buttercup	Piri Land Co., Auckland	4 267	375·2	365	27,108·1	1,079·14
Mature.						
Alcartra Clothilde Pietje	Vernon Marx, Mangatoki	7 355	350·0	365	31,312·5	1,145·24

Friesian Class Averages.

There was a falling-off in the number of Friesians entered for test during the year, the number of certificates being 59, as compared with 69 during 1933. From the point of average production, however, the position is extremely favourable, inasmuch as the average for the breed rose from 589·01 lb. fat for 1933 to the very high figure of 622·87 lb. fat for the period under review. A point which calls for special notice is the average of 744·10 lb. fat for the seventeen cows in the mature class. Individual records in this class ranged from 606·82 lb. fat for a cow withdrawn after 212 days on test to 1,050·07 lb. fat for Totara C.R. Buttercup. There was certainly a strong class last year. The Friesian class averages for 1934 and 1933 are as shown in Table 6 below.

FIG. 5. MONEVILLE SYLVIA POSCH MERCENA (M. S. RENNIE, MANGERE).
Highest C.O.R. Friesian, 1934, in senior two-year-old class: 20,589·5 lb. milk, 764·09 lb. butterfat.

Table 6.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1934.		lb.	lb.
Junior two-year-old ..	14	363	13,867·5	493·01
Senior two-year-old ..	9	365	15,257·4	563·57
Junior three-year-old ..	7	365	17,577·3	632·50
Senior three-year-old ..	5	358	17,851·5	685·89
Junior four-year-old ..	4	330	15,868·0	561·55
Senior four-year-old ..	3	356	18,965·2	674·62
Mature	17	352	20,212·7	744·10
	1933.			
Junior two-year-old ..	25	361	13,721·3	490·50
Senior two-year-old ..	6	365	15,966·9	582·18
Junior three-year-old ..	2	365	18,415·5	679·73
Senior three-year-old ..	3	364	18,073·1	618·51
Junior four-year-old ..	7	356	18,133·7	674·97
Senior four-year-old ..	4	365	18,150·5	687·85
Mature	22	351	18,127·1	645·24

The averages, class by class, of all certificates issued to Friesian cows since the commencement of the C.O.R. system in 1912, are given in the following table :—

Table 7.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year old ..	638	346	11,899·2	422·92
Senior two-year-old ..	266	348	12,802·1	455·96
Junior three-year-old ..	191	343	13,550·4	477·26
Senior three-year-old ..	191	337	14,108·8	507·01
Junior four-year-old ..	133	345	15,280·1	541·71
Senior four-year-old ..	132	347	16,207·0	567·98
Mature	582	342	16,147·2	568·44
All	2,133	344	13,993·6	495·51
Average test, 3·54.				

Friesian C.O.R. Bulls.

Two new names were added to the Friesian C.O.R. bull list during the year, the total now being 117. Some 613 sires are represented in the 1,744 Friesian cows (including the 305-day division) certificated to the end of 1934.

Milking Shorthorns.

Class Leaders.

There are no changes to report so far as the Milking Shorthorn class leaders are concerned. The highest record of the year was that of the mature cow Ashley Bank Sea-Spray, owned by Mr. J. Peach, of Sefton. This cow is credited with 709 lb. fat from 16,280·4 lb. milk produced in 365 days on a record commenced at 9 years 11 months. The Milking Shorthorn class leaders are as follows :—

Table 8.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old. Matangi Quality 4th	Ranstead Bros., Matangi	2 109	251·4	365	14,572·8	591·89
Senior Two-year-old. Matangi Quality 5th	Ranstead Bros., Matangi	2 204	200·9	365	11,752·8	542·66
Junior Three-year-old. Matangi Quality 4th	Ranstead Bros., Matangi	3 153	292·3	365	16,281·4	678·02
Senior Three-year-old. Matangi Rugh 2nd ..	Ranstead Bros., Matangi	3 304	307·4	365	14,032·7	747·86
Junior Four-year-old. Matangi Matilda 4th	Hon. Mrs. E. J. Blyth, Kohimarama	4 0	313·5	358	14,640·2	630·38
Senior Four-year-old. Ashley Bank Winsome	Peach Bros., Sefton	4 298	378·3	365	17,687·7	730·93
Mature. Glenthorpe Lady ..	A. J. Melville, Buckland	Mature	350·0	365	20,136·2	856·85

Milking Shorthorn Class Averages.

The number of cows of this breed which received certificates in 1934 was 12, the same number as in 1933. Their average production was 516·41 lb. fat from 12,412·7 lb. milk in an average lactation of 352 days. Seven of the cows were in the mature class, two in the junior four-year-old, one each in the junior three-year-old, senior three-year-old, and senior four-year-old class.

The averages, class by class, of all certificates issued to Milking Shorthorn cows since the commencement of C.O.R. testing for this breed in 1914, are given in the following table :—

Table 9.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	54	348	8,360·9	343·32
Senior two-year old ..	40	349	8,855·0	366·44
Junior three-year-old ..	26	335	9,731·4	392·55
Senior three-year-old ..	31	343	10,801·5	449·24
Junior four-year-old ..	26	350	11,097·5	454·38
Senior four-year-old ..	33	342	11,621·2	462·05
Mature	279	341	11,810·4	473·19
All .. .. Average test, 4·03	489	343	10,962·5	442·56

Milking Shorthorn C.O.R. Bulls.

No further Milking Shorthorn bulls qualified for the C.O.R. class during the year, the total remaining at fourteen. Some 146 sires were represented in the 443 cows of this breed certificated to the end of 1934.

Ayrshires.

Only two Ayrshires qualified for first-class C.O.R. in 1934. One of these, Dominion Jessabel, was a two-year-old bred at the Government Farm, Ruakura, and produced 363·28 lb. fat in 323 days. The other, a mature cow bred and tested by Messrs. W. Moore and Son, Masterton, gained a certificate for 640·44 lb. fat from 16,016·4 lb. milk in 365 days, having commenced her test at the age of 8 years 1 day. Neither of these performances affected the class leaders, the list remaining as follows :—

Table 10.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Fair Maid of Greenbank	W. Moore, Homebush	2 27	243·2	365	12,281·3	673·56
Three-year-old.						
Maesgwyn Victoria ..	C. Morgan Williams, Kaiapoi	3 250	302·0	365	16,507·7	646·98
Four-year-old.						
Ivanhoe Fancy ..	A. M. Weir, Menzies Ferry	4 308	344·3	365	14,207·7	713·93
Mature.						
Floss of Braeside ..	W. Moore, Homebush	7 287	350·0	365	20,305·5	832·72

Ayrshire Class Averages.

The averages, class by class, for all certificates issued to Ayrshire cows since the commencement of C.O.R. testing in 1912, are supplied by the following table :—

Table 11.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Two-year-old	69	345	8,995·1	373·40
Three-year-old	38	347	10,043·0	414·16
Four-year-old	27	346	11,378·0	459·52
Mature	110	348	11,942·9	485·96
All	244	347	10,750·9	440·02

Average test, 4·09.

Ayrshire C.O.R. Bulls.

No new names were added during the year to the list of Ayrshire C.O.R. bulls. The total is eleven, while 124 sires are represented in the 219 Ayrshire cows which have received certificates to the end of the calendar year 1934.

Red Polls.

Six cows of the Red Poll breed received certificates during the period under review, three being in the two-year-old class, two in the three-year-old, one in the four-year-old, and one in the mature. There were no outstanding performances. The six cows represented seven certificates, as one cow received two certificates during the year. The average production of the seven certificates was 363·65 lb. fat from 7,645·6 lb. milk in 349 days. The list of class leaders remains as follows :—

Table 12.

Name of Cow or Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
		Yrs. dys.	lb.		lb.	lb.
Two-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	2 188	259·3	365	11,228·0	511·42
Three-year-old.						
Dominion Gold Top	Central Development Farm, Weraroa	3 302	307·2	365	9,491·25	459·46
Four-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	4 297	343·2	365	13,290·0	580·05
Mature.						
Waihou Pip ..	W. Jackson, Waihou	7 25	385·0	365	12,681·8	537·90

Red Poll Class Averages.

The averages, class by class, for all certificates issued by Red Poll cows since the commencement of C.O.R. testing for this breed in 1918 are as shown in Table 13 on the following page.

Table 13.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Two-year-old	42	345	7,560·6	336·21
Three-year-old	16	346	7,905·1	349·63
Four-year-old	8	349	9,806·8	430·72
Mature	25	340	10,569·1	445·66
All	91	344	8,645·1	376·95
Average test, 4·36.				

Red Poll C.O.R. Bulls.

There are no new names to be added to the Red Poll C.O.R. bull list, the number remaining at four. The sixty-nine cows of this breed (including one in the 305-day division) certificated to date represent twenty-seven different sires.

(2) C.O.R. 305-DAY TEST DIVISION.

Of the 103 first-class 305-day certificates issued during the year under review 94 went to Jerseys, 8 to Friesians, and 1 to an Ayrshire. In addition, 3 Jerseys and 2 Friesians were granted second-class certificates in the 305-day division.

Jerseys.

Class Leaders.

Two changes took place in the class leaders. In the junior two-year-old class Erinview Moss, with 576·44 lb. fat, takes the place of Erinview Empress, with 523·99 lb. fat, both cows being owned by Mr. J. Murray, of Woodville. The other change relates to the four-year-old class, Hatcliffe Lady Gay, with 664·49 lb. fat, displacing Montrose Leonie (560·29 lb. fat), owned by Mr. V. J. Williams, Pukekohe. The class leaders are now as follows:—

Table 14.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Erinview Moss ..	J. Murray, Woodville	2 25	253·0	305	10,294·0	576·44
Senior Two-year-old.						
Erinview Joan ..	J. Murray, Woodville	2 339	284·4	305	10,130·1	607·08
Three-year-old.						
Glendale Silver ..	A. Montgomerie, Kauwhata	3 319	318·9	305	11,352·7	631·42
Four-year-old.						
Hatcliffe Lady Gay ..	H. J. Kaye	4 60	329·5	305	10,619·9	664·49
Mature.						
Perfection's Hopeful	J. A. Mitchell, Longburn	5 339	360·0	305	11,090·7	664·51

Jersey Class Averages.

The production averages, according to age class, of the 94 first-class certificates issued to cows of the Jersey breed during the year under review are given in Table 15. The average for all the cows was 426·40 lb. fat and the average test 5·64 per cent.

Table 15.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1934.		lb.	lb.
Junior two-year-old ..	41	291	6,555·1	372·28
Senior two-year-old ..	9	300	7,142·8	403·72
Three-year-old	13	300	7,968·2	458·80
Four-year-old ..	12	299	8,734·5	513·46
Mature	19	298	8,845·2	476·80

Friesians.

Class Leaders.

There are two new class leaders during the year so far as the Friesian 305-day division is concerned, one in the junior two-year-old class and the other in the junior three-year-old class. The junior four-year-old class still remains blank, no cow having yet been entered in this class. The class leaders are now as follows:—

Table 16.

Name of Cows and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Sealands Magpie Pietertje 2nd	H. G. A. Cameron, Weraroa	2 22	252·7	305	11,727·4	454·16
Senior Two-year-old.						
Rosevale Beauty Posch Griselda	E. H. Watson, Windsor	2 216	272·1	305	12,273·5	468·50
Junior Three-year-old.						
Totara De Kol Nina	Piri Land Co., Auckland	3 117	298·7	305	16,005·9	501·37
Senior Three-year-old.						
Sealands Alcartra Fobes	H. G. A. Cameron, Weraroa	3 304	317·4	305	10,407·8	389·04
Junior Four-year-old.	..	..	..	..	..	..
Senior Four-year-old.						
Ellerlea Aaggie Segis Minto	C. H. Steadman, Pokapu	4 357	359·2	305	15,311·9	557·71
Mature.						
Ellerlea Egie Segis Minto	C. H. Steadman, Pokapu	6 345	360·0	305	16,303·1	650·85

Friesian Class Averages.

The average production of the eight Friesians gaining certificates during the year was 437·04 lb. fat from 12,481·4 lb. milk in 304 days.

A pleasant feature of the conduct of the C.O.R. test is the unfailing courtesy and co-operation of the breeders' associations which are connected with this work. It is desired once more to record our thanks.

THE ERADICATION OF SOME PARASITES AFFECTING STOCK.*

J. E. McIlwaine, Veterinary Officer, Animal Husbandry Section, Wellington.

External Parasites of Cattle and Horses.

Although cattle may be free from skin parasites, at this season of the year inquiries are from time to time being made in regard to the treatment of cattle infested with lice. Cattle which are liable to be affected with lice are mainly young stock in a poor unthrifty condition and dairy cows which are low in condition. The majority of cases is therefore seen in stock in the winter and early spring months.

Occasionally very fat cattle are found to be affected. When affected with parasites the stock show evidence of excessive licking of the coat. The hair may be rubbed off in the region of the neck and tail, the animals are restless and frequently may be seen rubbing against posts, gates, and even the wire fences may suffer in consequence.

When stock are in such condition they do not readily put on flesh, and it is advisable to eradicate the parasites and at the same time to increase the food-supply so as to enable the animals to recover completely.

Although dipping the stock in cattle-dip is carried out for the destruction of ticks, it is seldom that large numbers of cattle are required to be treated for lice. Inquiries which have been received from farmers indicate that the majority requires some preparation for the hand dressing of a few stock. For this purpose the soap-kerosene emulsion has been found very effective. The following is the method of preparation of the emulsion: ½ lb. of soap is thoroughly dissolved in 1 gallon of boiling water. The next step is to add 1 pint of kerosene, at the same time stirring the soapy emulsion thoroughly. The whole is then diluted with water to make a total quantity of 4 gallons. When cold, the preparation is ready to be applied.

This preparation may be applied to the affected parts by using an ordinary grooming-brush. If the parasites are numerous and spread over the body, it is advisable to dress one quarter of the body only at any one dressing. It is advisable to repeat the application in from eight to ten days in order to destroy any parasites which have hatched out since the previous application.

* Portion of an address broadcast from Station 2YA.

This preparation can be used with equally satisfactory results in the case of horses. Quite recently a farmer dressed his horse with an arsenical preparation for the eradication of lice, the horse dying from the absorption of arsenic.

Mercurial ointments, although effective, are dangerous on account of the possibility of the mercurial preparations being licked off by the animal.

External Parasites of Pigs.

In the case of external parasites on pigs any oily preparation appears to give very satisfactory results. In this respect it may be mentioned that on account of the very warm, dry summer some pig-farmers may have considered the question of putting down a concrete wallow for the animals. Where shade from trees is not available such a wallow might be employed more extensively. The water in the concrete wallow should be coated with a thin layer of ordinary machine oil. When the pigs leave the wallow a coating of oil is left on the backs of the animals, and this effectively kills the parasites on the skin. Other means of applying oil to the skin of pigs apart from hand treatment of the animals consists of wrapping sacks saturated in oil round the rubbing posts in the pig paddock or pen. There is no doubt whatever that stock of all classes do better when free from parasites, and this specially applies in the case of pigs. Moreover, treatment on these lines, which need not be expensive or elaborate, will assist in the prevention of sarcoptic mange in pigs, and may also indirectly assist in the prevention of those black necrotic ulcers which sometimes form on the skin of pigs. All measures taken to relieve skin irritation and restlessness will result in increased gain in bodyweight per unit of food consumed.

Internal Parasites of Stock.

Many sheep-farmers and dairy-farmers will now be considering the treatment of their young stock for worms. Lungworm infestation of both calves and lambs is met with in young stock at this season of the year. On account of the dry season it may not be so prevalent as in other years, but there is no doubt about its prevalence on many farms. The disease is more prevalent on low-lying farms where the young stock are grazing in close contact, and where the carrying-capacity is higher than on poorer country. The characteristic symptom of the complaint is the dry husky nature of the cough. This cough is more evident after the animals have been exercised as in yarding. The affected animals cough persistently, the tongue often being protruded from the mouth. This coughing is an effort on the part of the animals to remove the small thread-like worms which are situated in the smaller bronchial tubes. The symptoms are slight at the onset of the trouble. There is some loss of appetite, an unthrifty appearance develops, and finally the affected animals lose condition. In severe cases in calves the animals often become affected with broncho-pneumonia in the later stages.

In the treatment of this condition in calves numerous agents have been tried with varying success. Injections of various volatile

agents into the windpipe have met with considerable success. This type of treatment should be left to the private veterinary practitioner of the district. A common treatment which is adopted in many dairying districts is the use of chloroform or ether as an anæsthetic. These substances reach the seat of the parasites, and there is little risk, as, even though the animals remain under the anæsthetic for some little time, no harm is done. There is a danger of collapse if advanced cases of the disease affected with bronchopneumonia are treated in this way. A common method adopted by some farmers is to pour about a teaspoonful of chloroform into the nostril of each affected calf, the calf's head being held so that the calf will inhale it. The parasites are coughed up in the discharges. The most serious aspect of lungworm infestation in young stock—*i.e.*, lambs and calves—is that stomach worms are usually associated with the lungworm in the same class of animal. The common system of feeding calves adopted throughout the country is to maintain a special paddock near the milking-shed, which is known as the calf-paddock. The main advantage in this case is that such a paddock is convenient for the feeding of the calves and some economy of labour in the feeding operations is effected. The permanent use of one paddock as a calf-paddock is, however, to be condemned on account of contamination of the grazing with parasites. If an interchange of paddocks could be arranged so that a fresh paddock would be available for the young stock each year, a considerable reduction in sickness and mortality would be effected. Under the present system the calf-paddock becomes calf-sick and good results are obtained only with considerable attention to improve feeding and management of the stock grazed therein. A calf-sick paddock should be grazed for a season with adult cattle or with horses, and should be limed, or ploughed and sown down in crop. Small weedy calves the constitutions of which are undermined with parasites cannot be expected to develop into healthy robust dairy stock. It is advisable therefore to take measures to build up this class of calf and treat it for parasites so as to enable it to survive the winter.

Evidence of stomach worm infestation in both calves and lambs may be as follows: The skin of the lamb may be of an excessively pale colour and not the usual healthy pink. The wool may be loose and come out easily. The mucous membranes of the mouth and eyes may be very pale. In both classes of stock the animals may show an unthrifty appearance and are likely to be light, undersized, and underdeveloped. If the infestation is a severe one the animals may show evidence of scouring in the later stages. At this stage it is a difficult matter to restore such stock to health. No type of treatment which does not include particular attention to the animal's diet can be recommended with confidence. In the case of calves thus affected the ordinary diet should be supplemented with a ration of crushed oats, linseed, bran, or other suitable concentrate. If the pasture is bare, silage or good quality hay should be provided.

In the medicinal treatment of calves and lambs some preparations have been tried with useful results. In the treatment

of calves for stomach-worms oil of turpentine may be given well diluted in milk. From a teaspoonful to a tablespoonful of oil of turpentine may be given to each calf, according to its size, well diluted in about ½ pint of milk. Lysol and Jeyes' Fluid have been given in medicinal amounts well diluted in some medium such as milk or water or even thin gruel. In many cases the bluestone solution which is used for dosing worm-infested lambs may also be used in the case of calves, the dose being correspondingly increased, depending upon the age and size of the calf. Then there are such drugs as carbon tetrachloride and tetrachlorethylene which are more commonly used in the case of parasites in lambs and sheep. Sheep tolerate these drugs better than cattle, so that turpentine, coal-tar preparations, and the bluestone solution, are more frequently used in the case of cattle. These drugs are usually prescribed when well diluted in liquid paraffin.

For the treatment of both cattle and sheep the following use of bluestone solution has been recommended by this Department: A 1-per-cent. solution of bluestone in water is prepared and the dosage of the stock arranged according to the age of the sheep and according to the age of the calf. A 1-per-cent. solution of bluestone may be prepared by dissolving 1½ oz. of bluestone in 1 gallon of water. The dosage for lambs and sheep is: lambs 1 fluid ounce, hoggets 2 ounces, and full-grown sheep 3 fluid ounces. Each calf may be given from 3 fluid ounces upwards, depending upon their age.

The dosing may be repeated at monthly intervals if considered necessary. In the case of lambs it is advisable to dose at about weaning-time, to be followed at three-weekly or monthly intervals as is found more convenient.

After dosing a change of pasture is desirable and if a rotation of pastures or fattening crops is available so much the better. It is most desirable that the feed conditions should be maintained and that the food available should be of an improving nourishing type rather than a deteriorating one. Where rape or barley and later on roots are available these crops serve quite well while they last. On such crops a run-off on grass is always desirable. If, however, such crops are not available and the pasture is poor, an attempt should be made to feed the lambs on some dry feed such as good-quality hay, silage, or a ration of oats or good-quality oaten chaff. Here, leaders will be necessary to teach the young sheep to eat the dry feed.

In all cases of stock infested by parasites rock-salt should be provided. A mineral lick may be provided in the place of the rock-salt, the lick being composed of salt with an addition of from 5 per cent. to 10 per cent. of the iron oxide known as limonite. The management in the rearing of young stock should ensure that the immature animal is kept in the highest attainable state of health during the developmental period. This applies with special force to dairy calves that are artificially fed. An ample margin of safety should be provided against unpredictable stresses—*i.e.*, bad food and inclement weather, &c.

CHEMISTRY OF WEED-KILLERS.

(Continued.)

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A short series of articles(1) published in this *Journal* during 1933-34 dealt with some general principles of the chemistry of weed-killers in relation to the control of ragwort (*Senecio Jacobaea*). More recently a comprehensive scheme of work has been undertaken to confirm and enlarge upon the results obtained from the earlier experiments made in the search for a substitute for sodium chlorate, which, as previously pointed out, although effective under the appropriate conditions, is dangerous to handle owing to the risk of fire and explosion.

The chemicals employed may be grouped in the following classes: thiocyanates, bisulphites, chromates and bichromates, chlorates and hypochlorites. In continuing the series of articles the additional experimental work will be described and discussed, this particular article being confined to the first group—namely, thiocyanates, sometimes referred to as sulphocyanides or sulphocyanates.

Thiocyanates as Weed-killers.

Further trials with thiocyanates were well warranted since they have the distinct advantage that, after the toxic effect has worn off and the weed has been killed, a nitrogenous residue is left in the soil. This acts as a fertilizer and tends to stimulate the regrowth of the pasture after the temporary setback caused by the weed-killer, ultimately leaving a better growth of grass.

Preliminary experiments on ragwort have shown that a 5-per-cent. water-solution of ammonium thiocyanate applied at the rate of from 250 to 450 gallons per acre gave a satisfactory result, as did also to a less extent a 2½-per-cent. solution. Weaker solutions were found to be ineffective and stronger solutions were not justified. Experiments were made to ascertain if smaller quantities of material per acre would be effective and thus lower the cost of treatment for farm practice. Undoubtedly the smallest quantity of solution per acre that can be applied to give complete coverage depends on the type of spraying-apparatus employed. In our work a small "Brown auto spray" pump was used, preliminary tests being made with three kinds of nozzles. The most efficient of these, a heavy brass one, gave complete coverage at the rate of approximately 200 gallons per acre—*i.e.*, 2 gallons of solution just wetting all the foliage on a plot 48 square yards in area. In the subsequent sprayings this nozzle was used throughout. Later in the season, when the ragwort was tall and had reached the full flowering stage, it was not possible to obtain complete coverage with this volume of solution owing to the greater amount of foliage.

Experiments were commenced at the end of October, last year, on fertile alluvial flats at Lower Hutt. The pasture, which was being grazed by dairy cattle, was thickly infested with ragwort in

the advanced rosette stage, averaging from 15,000 to 30,000 plants per acre. In the treatments the entire plots were covered irrespective of the ragwort distribution on the areas. The thick growth of ragwort and the probability of there being numerous small plants hidden in the grass suggested this procedure.

Spraying Trials.

On the 5th November, plots were sprayed with 2½-per-cent., 5-per-cent., and 10-per-cent. solutions of ammonium thiocyanate at the rate of 200 gallons per acre, and one with a 5-per-cent. solution at 400 gallons. This is equivalent to 50 lb. and 100 lb. of material

FIG. 1. LOWER HUTT AREA, SHOWING HIGH DEGREE OF INFESTATION WITH RAGWORT.

per acre for the first two plots respectively, and 200 lb. on each of the latter two. During the first week after treatment the entire plots presented a yellow, bleached appearance, but within three weeks the grass began to recover. After a period of seven weeks, during dry weather, the pasture was still slightly retarded, but at the end of nine weeks, following light rains, it was green, short, and in good condition, whereas that in untreated areas was in a dry, coarse, and rank state.

The results obtained from the latest counts made in the middle of January, 1935, were as follows:—

2½-per-cent. solution at 200 gallons per acre gave an 80-per-cent. kill.

5-per-cent. solution at 200 gallons per acre gave an 80-per-cent. kill.

10-per-cent. solution at 200 gallons per acre gave a 100-per-cent. kill.

5-per-cent. solution at 400 gallons per acre gave a 90-per-cent. kill.

FIG. 2. LOWER HUTT AREA, SHOWING CONTROL PLOTS ON EACH SIDE.
Plot treated with 400 gallons per acre of 5-per-cent. ammonium thiocyanate.
[*Photo by B. C. Aston.*

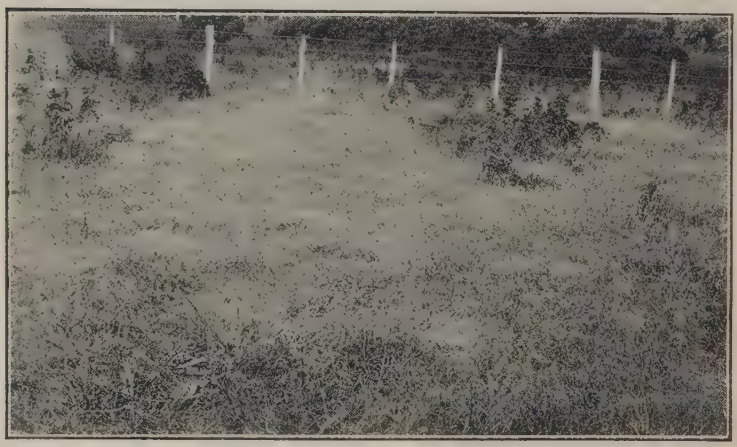

FIG. 3. LOWER HUTT AREA.
Plot treated with 200 gallons an acre of 10-per-cent. ammonium thiocyanate. Control plots on each side. [*Photo by B. C. Aston.*

It is interesting to note that, of the two plots each receiving 200 lb. of material per acre, the better result was obtained with the one where half the volume of water was used and therefore double the weight of chemical per gallon. This result needs to be confirmed if possible next season, as it may have been induced by peculiar local conditions of soil or climate. An important practical application of this would be that the use of unnecessarily large quantities of water, and the consequent labour, would be avoided.

In the second week of December, in continued dry weather, plots with tall ragwort in the flowering stage were treated with a 10-per-cent. solution at 200 gallons per acre. The results were unsatisfactory compared with the successes obtained in the earlier experiments. The stems appeared dead, but later small green shoots sprouted from the crown of the plants. In this instance it was noteworthy that the large amount of tall ragwort foliage on the plot made it difficult to obtain complete coverage with the same quantity of solution used on the younger ragwort.

In addition to the above experiments, Mr. C. R. Taylor, the Chemistry Section's Country Officer at Rotorua, conducted trials with ammonium thiocyanate, using a "Vermorel" knapsack sprayer. He reports as follows:—

> "2½-per-cent. solution gave less than 50-per-cent. kill. Grass returned to normal in ten days.
> "5-per-cent. solution gave 100-per-cent. kill. Grass scorched."

There is no record of the volume of solution applied per acre, but it is assumed that the treatment would be similar to that applied in practice by an efficient farmer. Generally speaking, the Rotorua experiments with thiocyanates, and more particularly with other weed-killers such as bisulphites, chromates, and hypochlorites, were more successful than was the case on the Lower Hutt farm. This may be attributed to differences in soil, climate, stage of growth, or the quantity of solution used.

Sodium Thiocyanate.

A quantity of crude sodium thiocyanate liquor was given a trial, the material being black, heavy, and of a semi-solid nature. It contains 6 per cent. of the fertilizing ingredient nitrogen, a very much less amount than ammonium thiocyanate, which contains 37 per cent. of nitrogen. For the sake of comparison it may be mentioned that sulphate of ammonia has about 20 per cent. of nitrogen. A 7½-per-cent. solution at 200 gallons per acre gave a 60-per-cent. kill, while a similar solution at 400 gallons per acre gave an 80-per-cent. kill. The grass was temporarily retarded, but at the end of ten weeks was in fairly good condition, being better than on untreated adjacent areas, but not so good as was obtained from ammonium thiocyanate treatment.

Mr. Taylor also used sodium thiocyanate, with the following results:—

> "Crude liquor: 10-per-cent. solution very unsatisfactory, giving only 25-per-cent. kill. Grass badly affected.
> "Crude fused material: Good at 10-per-cent. solution on ragwort in flower. 5-per-cent. solution unsatisfactory."

The sodium thiocyanate is a very impure, cheap by-product. The results suggest that insufficient allowance was made for the 50-per-cent. impurities present, and that the solutions should have been stronger. However, the table of costs (see page 169) indicates that it would be preferable to use the ammonium salt instead of stronger solutions of the sodium thiocyanate.

Dry Application of Ammonium Thiocyanate.

If ammonium thiocyanate were effective when sprinkled dry over ragwort-infested pasture, it would probably be most economically and conveniently applied in conjunction with the normal top-dressing operation on the farm. Mixing with lime is unsuitable, as this causes loss of nitrogen in the form of ammonia, so in these trials thiocyanate was mixed with superphosphate. The mixture was of a dark red colour, but this did not appear to affect the action of either of the ingredients. Superphosphate-thiocyanate mixtures were made up in lots containing 10 per cent., 15 per cent., and 25 per cent. respectively of thiocyanate, and applied at the rate of 4 cwt. per acre soon after mixing. The distribution was carried out on 2nd November. The plots were 54 square yards in area, and sand was added to the mixture as a diluent to facilitate even distribution when broadcasting by hand.

Following the treatment, the plots presented a bleached appearance for about a fortnight. A report after five weeks indicated that the grass was almost normal, while four weeks later it was green, in striking contrast to the grass on adjacent areas. The treatment containing the smallest quantity of thiocyanate—namely, 10 per cent.—was ineffective. The 15-per-cent. treatment gave a 75-per-cent. kill, while the 25-per-cent. plot gave over a 90-per-cent. kill.

Another plot was treated with the same amount of thiocyanate as the plot receiving the 15-per-cent. mixture, but in this case no superphosphate was added. The percentage kill was a little less than the corresponding superphosphate-thiocyanate plot, and the grass did not come away quite so well.

With thiocyanates, as in the case of some of the other weed-killers, the results were compared with those obtained by first cutting the ragwort close to the ground and treating after removal of the foliage. It was thought that this would avoid using large quantities of material on the foliage and enable the chemical to enter the root system by way of the open surface of the cut stems.

The 25-per-cent. mixture was therefore applied to a plot where the ragwort had been previously cut and removed. This was a complete failure, and two weeks later the ragwort was growing with more vigour than previously, as it had been apparently stimulated by the mixture of thiocyanate and superphosphate.

Some Considerations regarding Costs of Treatment.

From the farmers' viewpoint the cost of the treatment would be the limiting factor. The thiocyanates used in our experiments were generously supplied by the Manchester Oxide Co., England. This company originally quoted the price of ammonium thiocyanate at 6d. per pound landed in New Zealand, which, after the addition of

exchange and incidental expenses incurred in selling locally, might possibly enable the product to be made available to farmers at about 8d. or 9d. per pound.

A report of recent preliminary experiments at the Rothamsted Experimental Station, England, refers to experiments and calculations with respect to the fertilizing-value of the nitrogen in ammonium thiocyanate. It was ascertained that when it was applied to soil at even heavier rates than when used for weed-killing purposes most of the nitrogen was converted to nitrates and thus made available for plant nutrition. The fertilizing-value of the contained nitrogen was estimated to be 2d. per pound of ammonium thiocyanate, the calculation being based on the New Zealand price of sulphate of ammonia. After deducting 2d. for the value of the nitrogen plant-food, which where required should be taken into account in top-dressing practice, the price of the weed-killer would be 6d. per pound. However, we understand that the quoted price of the material might in the near future be subject to a reduction of 2d. per pound, thus bringing the final figure down to 4d. per pound. Sodium thiocyanate was originally quoted at 1½d. per pound f.o.b. English ports, but when due allowance has been made for shipping-expenses, exchange, and retailing costs, the chemical could probably be made available at about 2½d. per pound.

The following table has been included to show the price per acre for material to give the results obtained with the various treatments. The calculations are based, in the meantime, on 6d. per pound as being a market price of the ammonium thiocyanate, after arbitrarily allowing 2d. as the value of the nitrogen in the product.

Treatment.	Kill.	Cost per Acre. (Materials only.)
	Per Cent.	£ s. d.
Ammonium thiocyanate—		
2½-per-cent. solution at 200 gallons per acre ..	80	1 5 0
5-per-cent. solution at 200 gallons per acre ..	80	2 10 0
10-per-cent. solution at 200 gallons per acre ..	100	5 0 0
5-per-cent. solution at 400 gallons per acre ..	90	5 0 0
Sodium thiocyanate—		
7½-per-cent. solution at 200 gallons per acre ..	60	1 11 3
7½-per-cent. solution at 400 gallons per acre ..	80	3 2 6
Ammonium thiocyanate-superphosphate mixture—		
15-per-cent. of 4 cwt. per acre	75	1 13 7
25-per-cent. of 4 cwt. per acre	95	2 16 0

With reference to the costs of the material for the spraying treatments, it should be stressed that 200 gallons per acre was the minimum coverage obtainable with our apparatus, and this determined the minimum cost per acre. With a more expensive and efficient pressure pump the cost would be reduced to approximately a quarter by obtaining coverage with 50 gallons per acre. Mr. J. W. Deem, late Director of the Fields Division, in recording(2) ragwort treatment with sodium chlorate, mentions that coverage was obtained at the rate of 420 gallons of solution per acre, using a knapsack spray-pump. However, with a Davis bulk pump he was able to cover an

acre with only 59 gallons of solution. In another instance Mr. Deem describes treating an acre with a 5-per-cent. solution, using 24 lb. of sodium chlorate, which is equivalent to 48 gallons per acre.

In the case of the dry mixtures the cost of the superphosphate was not taken into account. However, it could be assumed that this method would be used only where the farmer had intended to top-dress at the time of ragwort treatment.

Instead of striving for a 100-per-cent. kill it might possibly be more economical to be satisfied with about an 80-per-cent. kill after the first treatment, and then deal with the surviving plants by individual retreatment. It would seem that this could easily be done by spraying or by placing a small amount of dry material directly on the plant. For this purpose one of the other classes of chemicals may be more suitable—*e.g.*, sodium bisulphite, which is cheaper and more convenient to handle in the dry state than ammonium thiocyanate. (Bisulphites will be dealt with in a subsequent article, when further detailed results are available.) The application could be made by hand from a bucket or sack, or by using one of the various types of mechanical devices designed for this purpose. These usually consist of metallic cylinders from 4 ft. to 5 ft. long containing the dry weed-killer. When the instrument is stamped on the crown of a ragwort plant, an aperture is automatically opened at the base of the cylinder, and the requisite quantity of chemical is ejected on to the bruised plant, the aperture closing immediately the instrument is raised from the ground. This appears to afford a cheap, simple, and convenient method of dealing with scattered plants.

As previously stated, the spraying activities entailed the covering of the entire plots with solution, and the costs per acre were calculated on this basis; therefore, where the ragwort exists as scattered plants or clumps, the cost per acre of treatment is thus proportionately reduced.

In interpreting the results of the above experiments it should be emphasized that the past summer has been abnormally dry, a factor which appears to be favourable to the success of thiocyanate as a weed-killer. There was no appreciable quantity of rain until eight days after the spraying experiments and eleven days after the dry application. Within four weeks after treatment there were only about eight really wet days. The next month, December, was also very dry; according to the meteorological reports there was only one wet day. This unduly dry season may have accounted for the success of the thiocyanate treatments, and it has yet to be proved whether the results can be reproduced in normal periods.

Properties of Thiocyanates.

The following points are noteworthy in regard to ammonium thiocyanate: When the pasture on the plots sprayed with the material had recovered, cattle grazing in the paddock showed a decided preference for these areas. Mr. Taylor also stressed this point.

Ammonium thiocyanate is a white crystalline substance extremely soluble and readily absorbing moisture from the atmosphere, becoming

moist and inconvenient to handle if left exposed. Hence it is preferable to carry it in tin or wooden containers rather than in bags. It corrodes iron, copper, brass, and galvanized iron, but does not attack aluminium vessels. The kerosene tins and buckets used in our field work were not damaged, but these and the spraying-apparatus should be well rinsed after use. When the thiocyanate comes in contact with rust particles, a deep red colour is produced. This is a harmless reaction and does not alter its weed-killing properties. The material has a shrinking effect on leather, and rubber shoes are best used during operations. It is not combustible or explosive when in contact with organic materials, whereas sodium chlorate forms dangerously combustible mixtures. There is no fire hazard in using ammonium thiocyanate or its solution, and in this respect it is absolutely safe. It has a cold, repellent, salty taste, and, according to Harvey(3), "is not liked by cattle and is not as poisonous as chlorates are to live-stock." Nevertheless, as in the case of top-dressing, it would be a precaution not to put cattle on to treated areas for a few days.

An eminent medical authority in England has expressed the following opinions :—

(1) That the toxicity of sulphocyanides (thiocyanates) is negligible when compared with cyanides, and that even when administered in large doses they would be extremely unlikely to cause death :
(2) That poisoning by sulphocyanides (thiocyanates) is practically unknown, despite the fact that they are used in every chemical laboratory and in industry—*e.g.*, photography :
(3) That they do not give off any poisonous fumes, except possibly at high temperatures :
(4) That the handling of the substances does not call for any special precautions :
(5) That so far as transport is concerned, provided they are packed in airtight containers and stored away from strong sulphuric acid, no possible danger can ensue, and even if a packet became damaged no danger would result from the substances coming into contact with wood, iron, paint, straw, &c.

Possibilities for Thiocyanates.

The thiocyanates certainly appear to have possibilities as weed eradicants in horticultural practice. Their toxic properties also suggest their thorough trial on gorse, blackberry, thistles, and other highly pernicious weeds. Our experiments in these directions have given some interesting results during the abnormally dry weather prevailing in the summer of 1934 35. For weeds on lawns and garden paths the results have been very encouraging.

As regards ragwort, chances of success with thiocyanates are considerably enhanced if the plants are still in the rosette stage, and, if possible, treatment is made when there is little prospect of heavy rain immediately after application.

Ammonium thiocyanate is a comparatively new substance for the control of weeds, and of ragwort particularly : the best method of application for various localities has yet to be ascertained. However,

it appears that under appropriate conditions it may yet prove to be a successful, convenient, economical, and safe substitute for sodium chlorate and the arsenical compounds, at the same time ultimately leaving a fertilizing residue in the soil.

Thanks are due to Messrs. M. R. Coup and R. J. Park for assistance in the field work in connection with the experiments discussed in this article, and to Mr. C. Brodie, Lower Hutt, for the use of the paddocks on his farm.

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REFERENCES.

(1) B. C. ASTON and J. A. BRUCE: *N.Z. Journal of Agriculture, 46*, p. 108, Feb., 1933; *46*, p. 230, April, 1933; *47*, p. 4, July, 1933; *48*, p. 172, March, 1934.

(2) J. W. DEEM: *N.Z. Journal of Agriculture, 43*, p. 105, August, 1931; *47*, p. 99, August, 1933.

(3) R. B. HARVEY: "Ammonium Thiocyanate as a Weed Eradicant." Minn. Agric. Expt. Stat. Circular, May, 1933.

THE HOST RANGE OF *PHOMA LINGAM.*

ITS SIGNIFICANCE TO SWEDE PRODUCTION IN NEW ZEALAND.

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THE dry-rot organism (*Phoma lingam*) was recorded in New Zealand on swede, turnip, and cabbage by Cunningham (1927). No additional hosts were recorded until Neill and Brien (1933) secured the organism from chou moellier and rape. In February, 1934, *P. lingam* was isolated from a stem canker on a wild turnip plant (*Brassica campestris*) and the following May from leaf-spots on rape, cabbage, and cauliflower seedlings.* These latter plants were grown beside infected swede seedlings while the wild turnip grew in a rape crop on land which the previous season had produced a dry-rot infected swede crop.

EXTENSION OF HOST RANGE.

Experiments were carried out to determine whether cruciferous weeds and garden plants are capable of carrying infection.

Inoculations with a single spore culture of *P. lingam* strain IIB were made by (*a*) spraying plants with aqueous spore suspensions, (*b*) by injecting spore suspensions between the leaf surfaces with a hypodermic syringe,† and (*c*) in two cases by inserting mycelium into incisions in the stems.

Using method (*a*) spore suspensions were sprayed on (i) seedlings in the glasshouse; (ii) young potted plants placed for forty-eight hours in an incubator at approximately 21° C. and 100 per cent. relative humidity; and (iii) on mature plants growing in the glasshouse. In this series positive infection developed only on

* Strain IIB was obtained from cabbage, cauliflower, and wild turnip, and strain IIA from rape.

† Slight blistering was caused by the injections, but this did not appear to injure the leaves of non-susceptible plants.

mature plants, but by the hypodermic method infection was secured on the leaves of young plants in May, and of flowering plants in June, strain IIB being isolated from the lesions in all cases.

In the following table are recorded the results of inoculations and also the general distribution of the plants in New Zealand.

Table 1.—Inoculation of Cruciferous Plants with P. lingam.

Plant inoculated.	Results of Inoculations.				Distribution in New Zealand.
	Spray.	Hypodermic.		Stem Insertion.	
		17/5/32.	20/6/32.		
Arabis albida	—	+	+	..	Cultivated.
Alyssum calcineum	—	—	—	..	,,
Barbarea stricta	—	—	—	..	W.G.
,, verna	—	—	—	..	,,
,, vulgaris	—	—	—	..	,,
Brassica arvensis†	+	—	+	..	,,
,, campestris*† ..	—	+	+	..	F.
,, oleracea	+	+	+	..	W. Coast
Capsella-bursa-pastoris† ..	—	—	—	..	F.W.G.
Cardamine heterophylla ..	—	—	—	..	Forest.
Cherianthus cheri	—	+	+	..	Cultivated.
Coronopus didyma	—	—	—	..	F.W.G.
,, procumbens ..	—	—	..	..	F.W.
Diplotaxis muralis	+	+	+	..	G. Coast.
,, (Siliquas) ..	..	..	+	..	,,
Lepidium ruderale	—	—	—	..	F.W.G.
,, campestre	—	—	—	..	F.
Matthiola incana†	—	—	+	..	Coast.
Raphanus sativus	—	—	+	..	W.
Sisymbrium officinale ..	—	—	—	..	F.W.G.
,, oreintale ..	—	+	+	..	G.
,, sophia	—	—	—	..	W.
Cultivated plants—					
Cabbage stems†	—	..	..	+	Cultivated.
,, leaves*†	+	+	+	..	,,
Cauliflower*†	..	..	..	..	,,
Chou moellier*	—	+	+	+	,,
Rape*†	+	..	+	..	,,
Swede bulbs*†	—	+	+	..	,,
,, leaves*†	..	+	+	..	,,
Turnips*†	—	..	..	..	,,

NOTE: + = Infection by *P. lingam*; — = No infection produced. Distribution of weed plants (F. = Field; W. = Wayside; G. = Garden). * = Hosts on which *P. lingam* was collected in the field in New Zealand. † = Recorded as hosts of *P. lingam* overseas (Henderson (1918) and Buddin (1934).)

SIGNIFICANCE OF HOST RANGE.

In New Zealand field infection of crucifers other than swedes and turnips is rare, and appears to be associated with infected root crops or to occur on land which carried a diseased crop the previous season. The possibility of chou moellier, rape, cabbage, or cauliflower introducing the disease to root crops seems remote, as *P. lingam* has been secured but twice on these hosts since 1927. Of the weed hosts, only wild turnip is common to farm-land. This plant may possibly introduce the disease to root crops; but, as commercial growers in New Zealand avoid districts in which wild turnip is present, it is unlikely to carry infection to seed crops. The remaining hosts are scarcely likely to be of significance

in introducing dry-rot to swedes or turnips since they are either rare or of limited distribution, and, as yet, have not been found naturally infected.

FIG. 1. TYPICAL P. LINGAM LESION ON RAPE-LEAF: XI.
[*Photo by H. Drake.*

LITERATURE CITED.

BUDDIN, W.: The Canker and Dry-rot Disease of Swedes. Ministry of Agriculture and Fisheries, Bull. No. 74, 48 pp.; 1934.

CUNNINGHAM, G. H.: Dry-rot of Swedes and Turnips, its Cause and Control. N.Z. Dept. of Agric., Bull. 133, 51 pp.; 1927.

HENDERSON, M. P.: The Black-leg Disease of Cabbage caused by *Phoma lingam* (Tode) Desm. *Phytopathology*, Vol. 8, pp. 379–431; 1918.

NEILL, J. C., and BRIEN, R. M.: Occurrence of Dry-rot on Rape and Chou Moellier in the Field. *N.Z. Journ. of Agric.*, Vol. 47, pp. 19–20; 1933.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 7th February to 21st February, 1935, include the following of agricultural interest:—

No. 71436: Removing gases from milk; T. E. French and the Aluminium Plant and Vessel Co., Ltd. No. 72080: Teat-cup; H. F. Taylor. No. 72265: Insecticide; E. Hope. No. 71912: Harrow; P. D. Tennent. No. 72031: Milking-appliance; G. H. Gascoigne and J. R. Knox. No. 72301: Milking-machine pulsator; T. Shiels. No. 72334: Meat-carrier rail; A. S. Parker. No. 72575: Agricultural implement; G. T. Zohrab.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Commissioner of Patents, Wellington, price 1s., prepaid.

PROGRESS OF THE CONTROL OF THE WHITE BUTTERFLY BY *PTEROMALUS PUPARUM.*

J. MUGGERIDGE, Entomologist, Plant Research Station, Palmerston North.

THE white butterfly at the present time may be found in most parts of the North Island, and is also beginning to make its presence felt in parts of the South Island.

During the past year the Department of Agriculture bred up large quantities of parasites in order to start colonies in those parts where the butterfly is present and where no parasites had previously been liberated.

The butterfly first became prevalent in Hawke's Bay, and it was in this locality that the natural enemies were first liberated. In January and February of 1933 the first consignment of *Pteromalus puparum* was liberated at Maraekakaho, near Hastings. In the 1934 season further supplies of this parasite were liberated at Maraekakaho, and towards the latter part of this season field investigations indicated that the parasite was spreading rapidly from the initial point of liberation and was commencing to exercise a fair amount of control. Field investigations for the current season indicate that the work of the parasite is outstanding in that the Hawke's Bay infestation at the time of writing has been reduced to such an extent that comparatively few butterflies are seen, though no doubt they exist in fair numbers in restricted areas. In other parts of New Zealand, notably from Wellington right along the coast to New Plymouth, the butterfly has been able to multiply unchecked and consequently large areas of crops are being destroyed, and many in this area are beginning to wonder whether the parasite is of any value. It must be understood clearly that, on account of the enormous population of butterflies, some considerable time must elapse before the parasite begins to overtake its host, since apart from a few that were liberated around Palmerston North, Marton, and Fordell no individuals of *P. puparum* were distributed in the Wellington and Taranaki districts before the current season.

Some farmers seem to be under the impression that all that is necessary is to obtain parasites from the Department of Agriculture and liberate them on the crops, and that by some magic the butterfly will disappear. Unfortunately this does not happen, and it is only after the parasite has had sufficient time to breed and multiply into large numbers that the effect of its presence will be properly felt.

During this season the Department, from its comparatively small stocks of material, can hope to establish initial parasite colonies only, from which it is confidently expected the parasites will spread successfully, and, after a season or so, breed in sufficient quantities to exert the control desired. Up to the present 550,000 parasites have been sent out. Large colonies of these have been distributed on crops which it was felt were suitable from the point of view of parasite-establishment.

In Hawke's Bay during two seasons two colonies of ten thousand parasites were liberated in the one locality, and a good control is being obtained. Many more colonies greater than this number have been liberated over other parts of the North Island generally, so that it is reasonable to expect that towards the end of next season, or some time in the season following, a satisfactory degree of control will be obtained in infested areas generally. Too hasty judgment on the efficiency of the parasite should be avoided, since experience

in Hawke's Bay leads one to expect confidently that the same satisfactory control as in Hawke's Bay will be eventually secured in other areas where the parasite becomes established.

SEED-WHEAT CERTIFICATION.

CERTIFIED CROPS.

UNDER the Government scheme for the certification of seed-wheat, the following growers have seed for sale from crops which have passed both field and grain inspections. (A previous list, to which purchasers are referred, was published in the February *Journal*.)

Variety.	Grower.	Acreage.
Cross 7	*†Blackwater Estate, care of H. Neave, Leeston	18
	*Canterbury Seed Co., Leeston	22
	*†J. O'Boyle, Lakeside	10
Hunters II	*Canterbury Seed Co., Leeston	18
Solid Straw Tuscan ..	‡A. Allen, Killinchy, R.M.D., Leeston ..	12
	H. Oliver, Hororata	11
	T. Pascoe, Halkett	10
	T. E. Pearson, Hororata	30
	‡J. S. Templeton, 238 Lincoln Road, Halswell	10
	Estate of J. Barclay, Mount Hutt Rural, Rakaia	40
	R. E. Cairns, Mount Hutt Rural, Rakaia ..	8
	C. Chamberlain, R.M.D., Winchmore ..	20
	L. A. Maidens, R.M.D., Winchmore ..	40
	Westgarth Bros., South R.D., Kingsdown ..	16
Dreadnought 5/27 ..	J. Kinnimont, Kauru Hill	10

* Passed subject to machine dressing of seed. † Contract to Canterbury Seed Co.
‡ Portion of line passed subject to machine dressing.

—*Fields Division.*

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SEASONAL NOTES.

THE FARM.

Importance of Top-dressing.

WHILE the continued relatively low level of prices of farm produce generally makes it necessary to keep down expenditure as much as possible, it is very desirable to avoid passing beyond the borders of true economy into the state of unwise parsimony. Experience has shown that this passage from economy to parsimony can readily take place in top-dressing, and it is significant that certain farmers who partially or wholly curtailed sound top-dressing programmes in recent times under the stress of the difficult conditions in farming have already reverted to the former freer use of fertilizers on their pastures. It may be said definitely that generally, the wisest course lies in the carrying-out, in the coming few months, of a top-dressing programme, greater than has been adopted at any time in the past. There is abundant evidence not only that top-dressing widely may be employed to improve the farm position, but also that if it is not so employed, the position frequently will not remain stationary, but will become steadily worse. Discontinuance of top-dressing is not always associated immediately with falling off in farm production, but it seems to be associated with immediate commencement of deterioration in the quality and vigour of the pastures. Normally this deterioration is gradual at the outset on account of the residual effect of manures applied previously and, because it occurs gradually, the deterioration at times escapes notice for a period, but in the second season, without top-dressing, it usually becomes obvious even to quite casual observers, because there is a marked change in the character of the herbage—frequently rye-grass and cocksfoot decline while such plants as brown-top and flat weeds increase in prominence and vigour.

Normally any successful system of regular top-dressing results in increased amounts of farm produce removed from specific pastures, and this is associated with increased removal of the substances supplied by fertilizers. But the increase in the amount of these substances removed from the land as the result of top-dressing is never as great as the amount of these substances supplied to the land by top-dressing. For instance, the increase in the lamb-crop due to top-dressing does not contain as much phosphate as is supplied in the prior top-dressing. It follows from this that normally top-dressing creates reserves of fertility which represent part of the current capital value of the farm, and a type of management which draws upon these reserves without replacement simply means operating upon capital instead of upon income. From these facts it may be deduced that a farmer, in considering his top-dressing programme, should be influenced, not only by the extent to which a given amount of fertilizers will increase the production of his pastures in the coming season, but also by the amount of prospective decline in production, say two seasons hence, if top-dressing is not carried out. And intelligent drafting of top-dressing programmes should take into account the fact that, while there has been a substantial decline in the price of farm produce, there also has been a substantial decline in the cost of fertilizing substances in the same period.

Phosphatic Top-dressing of Prime Importance.

Almost invariably the first result to be sought in top-dressing is strengthening the supply of available phosphates. Accumulated experience in the field well justifies the very general use of superphosphate which gives

superior results under low-rainfall conditions, and which generally at least equals, if it does not excel, other phosphatic manures where the rainfall ranges from moderate to high. Of the phosphatic manures, superphosphate most quickly brings about additional growth ; the duration of its influence is far from being as short as is sometimes suggested—which is illustrated by the fact that substantial benefit from superphosphate has been noted to continue after twelve months and more from its application. Further, superphosphate does not cause any permanent increase in the sourness of the soil and extensive field experience shows that, normally, repeated use of superphosphate on the same land is associated with increased fertility which is reflected in improved appearance and production of pastures. Over wide areas with fairly heavy rainfall basic slag is known to give good results, and in districts of good rainfall the various Island and African phosphates may be expected to prove satisfactory.

Use of Nitrogenous Manures.

Especially when there is a prospect of a shortage of winter feed, it may prove profitable to apply a soluble nitrogenous manure such as sulphate of ammonia in late March and April, at the rate of about 1 cwt. an acre. The use of such a nitrogenous fertilizer alone is seldom satisfactory, and, usually, to obtain satisfactory results, phosphates should be applied at the same time, as, or shortly before, the nitrogenous material, and frequently the fullest benefit from the use of sulphate of ammonia is also associated with recent liming. The best effects from nitrogenous manures as a rule result from their use on vigorous, well-drained pastures in which rye-grass is prominent.

Liming.

In New Zealand liming of grassland has produced very diverse visible results ; sometimes liming is clearly advisable and sometimes it has no apparent influence. In view of this, expenditure on liming should not be made on the basis of mere surmise or tradition, but should be justified by real evidence of success attending its use under circumstances similar in essential respects. Those seeking to reduce their outlay on top-dressing at times resort to lime as a cheap substitute for phosphates. This is seldom financially attractive for, while there is a considerable area on which a mixture of lime and superphosphate gives good results, the area on which the results from lime alone are satisfactory appears to be very restricted. As a rule, if standard dressings of phosphates have not a satisfactory influence, then lime in association with phosphates is well worth a trial on the land. Apart from field trials, no methods of ascertaining the amount of lime that may be applied to land profitably have been shown to be reliable to any considerable extent.

Autumn Management of Grassland.

Widely, autumn harrowing of pastures is very desirable, and it should be thorough enough to bring about even distribution of droppings, which, when suitably broken up and scattered are of considerable fertilizing value, but which, if left undisturbed, bring about deterioration instead of improvement of the sward, and magnify the task of efficient grazing management.

At times young pastures deteriorate rapidly because of an initial lack of fertility, and, as a rule, it is much better to prevent this by suitable top-dressing in good time than later on to renew or repair deteriorated swards. Hence, in conditions in which top-dressing is of known value, a special effort should be made to top-dress newly established pastures.

Provision of Feed for Winter and Spring.

Over wide areas, the recent widespread and welcome rains have brought a welcome change in the growth and the colour of pastures. In regard to feed for the coming winter and spring, this change seems to have given some farmers an unjustified feeling of security. While the additional growth resulting from the recent rains is most valuable as a means of maintaining the stock in good condition prior to the comparatively severe winter and spring period, it should be remembered firstly that many farmers are facing the period mentioned with unusually low reserves of feed; secondly the feed produced by pastures between now and winter is not likely to be so substantial as present appearances might lead one to expect, because the current warm conditions that beget rapid growth are likely to disappear in the normal manner, and thirdly that in any case, the growth made under the current conditions is likely to be of a lush immature character, and to lack the value for winter-feeding that attaches to the more mature herbage customarily available for winter. Because of these facts, much reliance clearly cannot be placed safely upon the feed resulting from recent rains, and crop production fitted to strengthen the weak feed position generally should be proceeded with as quickly as possible. One of the most important steps that still may be taken in this respect is the sowing of cereals: if feed is definitely desired as quickly as possible, then barley or white oats should be sown, but in districts in which white oats are subject to severe attacks of rust, they should be grown only if it is intended to use them simply as a catch crop for green feed, and not to let them develop eventually into a grain or chaff crop. When early feed is not desired specially, Algerian oats which rightly are popular for green feed, may well be sown; they can be fed off and then allowed to grow to yield good chaff. Algerians successfully can be fed off with great severity, but Gartons should be eaten down once only and that quickly. Oats for winter and spring feed and subsequent grain or chaff production should, if possible, be sown not later than April or early May, and usually it will prove profitable to fertilize with from 1 cwt. to 2 cwt. an acre of superphosphate, while, if the crop is to be grown on land exhausted to some extent by previous arable cropping, it may be profitable to use ammoniated superphosphate so as to assist in creating a correct supply of nitrogen. In sowing oats in the autumn for feeding off and subsequent grain or chaff production a seeding of from 1½ bushels to 2 bushels an acre is popular, while in sowing oats for green feed alone, as a catch crop, a seeding of 2½ bushels an acre may be expected to give good results. When oats are sown broadcast failures which occasionally occur are sometimes attributed to poor seed, when really they are due to inadequate covering of the seed facilitating depredations of birds. Barley, which is of distinct value for early green feed—*e.g.*, in May—is sometimes used for spring green feed for which it does not yield as well as oats, and if the barley is fed when running to seed it may cause digestive disorders in stock.

In order to build up the maximum possible supplies of winter feed, steps should be taken to turn into silage or hay, before injury by frost has occurred, any available green maize or millet. Because some difficulty may be experienced in drying the coarse herbage satisfactorily, silage should be made in preference to hay if the amount of green material available is not so small as to lead to undue wastage in ensilage. In ensilage wastage occurs almost wholly at the surface, and in small quantities of crop the amount of surface is proportionately high.

In using cereals for green feed, apart from the prior reference to Gartons oats, better results are obtained usually by feeding off two and three times when the growth is not very tall instead of waiting until there is tall growth, which not only is likely to bring about relatively

heavy wastage by trampling, but may lead to a poor second growth. Swedes attacked to a considerable extent by dry rot should be utilized without any avoidable delay.

In some instances the unfavourable season has upset plans for the provision of winter feed for pigs, and farmers are exploring the possibility at this stage of growing crops specially to meet the winter needs of pigs. It is impossible generally at this season to begin the production of crops fully satisfactory for direct use by pigs. However, especially when it is a case of making provision for fairly mature pigs, such as sows and boars, indirect measures may be taken by growing the cereal crops already mentioned, feeding them to the cows and thereby increasing the amount of fresh leafy growth available on the pastures for the pigs.

General Cropping Work.

In the main South Island wheat-growing districts, autumn and early winter prove the ideal sowing season for wheat which fares best on a fine firm seed-bed. Extensive experimental work has shown that over a wide area wheat responds profitably to a dressing of 1 cwt. of superphosphate to the acre, and as the experimental work has been fully confirmed in farm practice, the manuring of wheat in conformity with the findings of systematic investigation rightly is becoming standard practice.

Commonly occurring smuts of wheat, oats, and barley may be controlled effectively by suitable inexpensive treatment of the seed prior to sowing, and yet these smuts annually cause substantial losses in the crops of the Dominion. Probably the neglect regarding smut control is greatest in the case of oats, partly because there is a tendency to ignore the undesirability of smut in oats harvested as chaff. Seed treatment, if not suitably carried out, is very likely either to be ineffective in controlling the smut, or to lead to serious damage to the treated seed. Within recent years, the introduction of such materials as copper-carbonate and organic-mercury dusts has added to the convenience and simplicity of proper seed treatment. Full particulars of approved methods of the treatment of cereal seed are given in this *Journal*, July, 1934, and also may be obtained from the officers of the Fields Division in the various districts.

The preparation of the seed-beds of autumn-sown cereals is at times not as thorough as is desirable. Clods on the surface of such seed-beds are desirable rather than undesirable, because they tend to provide shelter for the seedlings and to check the setting of the surface layer of soil into a hard layer, but below the surface fineness and firmness in the seed-beds is desirable. Because of the desirability of firmness in the seed-bed for wheat, it is at times possible to dispense with ploughing when wheat is to follow potatoes or peas, thorough disking being sufficient. When wheat is to follow pasture skim-ploughing should be done early in the autumn, and if it has not already been done it should be carried out as soon as possible. After the skimmed furrows have had the benefit of from six to eight weeks weathering, they should be disked and the land then ploughed to the full depth.

Autumn treatment of lucerne at times is of importance. The growth made during the latter part of the season occasionally is grazed. Because such grazing necessarily involves trampling, which definitely favours the entrance of grass, it is usually inadvisable in the interests of the lucerne, and this particularly applies to districts of good rainfall in which grass may become such a strong competitor as to be one of the worst weeds affecting lucerne.

—R. P. Connell, Fields Division, Palmerston North.

THE ORCHARD.

Late Spraying.

At this period of the year operations in the orchard are confined mostly to harvesting and preparing for market the crop of pome fruits. It is during this busy period that the control of certain pests and diseases is sometimes not given the necessary attention. A close watch should be kept on late varieties of apples and pears in order to guard against late infection of black-spot and pear-scab in particular. Early autumn rains, which have been experienced in many localities during the present season, favour the development of these diseases. Immediately infection is noticed it is wise to spray with lime-sulphur 0·083 per cent. plus colloidal sulphur 2 lb. to 100 gallons of spray. Lead arsenate at a strength of 1½ lb. to 100 gallons should be added to this spray for the control of leaf-roller caterpillar. For pears Bordeaux mixture 3–4–50 plus lead arsenate is recommended.

Fruit Export Work.

Reports from several districts indicate that the fruit is maturing earlier this season than in the average season, consequently where this condition is observed picking-dates should be advanced accordingly. It should be borne in mind that over-mature fruit, if exported, cannot be expected to arrive at its destination in a satisfactory condition. Fruit that has passed the suitable stage of maturity for export, even though it may be packed some time prior to the closing-date for the variety concerned, is certain to be rejected by the inspectors. Any line of fruit that has reached the border-line between mature and over-mature should have the larger sizes withdrawn and only the smaller sizes submitted for inspection. Many varieties of fruit picked before fully developed are inclined to wilt during transit, and fail to develop the true and full flavour of the variety. While this condition is to be carefully guarded against, to maintain the good reputation of New Zealand fruit on the overseas markets, it is possible that even greater damage to the reputation of our fruit and lower market realizations would result from the export of over-mature fruit.

Cold Storage for the Local Market.

Storage rots each season take a heavy toll of the fruit held in cool stores. This loss could be considerably reduced by more care being taken in the various handling operations. Many of the fungus diseases responsible for storage rots can enter the fruit only when the skin has been broken. Consequently the greatest possible care should be taken in grading to exclude all fruits showing even a minute rupture of the skin. It is important to have the fruit, particularly pears, placed in cool store as soon as possible after picking.

Ordinary Storage of Fruit.

The practice of keeping apples and pears in ordinary storage to prevent placing them on a glutted market is quite satisfactory with many of the late varieties. Fruit for such storage should receive the same careful grading and handling as for cool storage. Conditions suitable for the storage of fruit are a cool and even temperature with moderate ventilation. Fruit stored in cases under dense evergreen trees and covered with loose sheets of corrugated iron often keeps in an excellent condition. The drawback to this form of storage is the difficulty of preventing damage by rodents. Fruit exposed to excess ventilation is inclined to wilt, whereas insufficient ventilation encourages the development of storage rots. When left on the ground for any appreciable period the flavour of fruit is often found to be affected adversely.

Care of Budded Trees.

All buds should be examined about three weeks after they have been inserted. If the bud is then showing signs of wilting, it is practically certain that it has failed to take. A further bud can often be inserted with satisfactory results, at this time, even though the trees may have ceased growth. Bands which have not been cut should be watched, and any tendency for them to cut into the stock should be prevented by cutting the tie along the branch on the side opposite to the bud.

—P. Everett, Orchard Instructor, Gisborne.

Citrus Notes.

The recent rains following the lengthy hot dry spell will cause the trees to throw out much new growth, which will be soft and tender, and likely to suffer injury from frosts during the winter. Therefore nitrogenous fertilizer should not be used, as it will tend to make the growth more succulent. Potassic or phosphatic fertilizers are the safest to use at this juncture, as they will have a hardening effect and will in some measure help the trees to withstand the winter.

The soil will now be in a good condition for the sowing of a cover crop to be ploughed in later in the season. As some fertilizer will be of assistance to the cover crop the sowing of the seed should coincide with the autumn application of manures. Lupins, peas, beans, and tares all produce a fair volume of green material for ploughing under. When working the soil prior to the sowing of cover crops, care should be taken to make a slight slope away from the trees to prevent stagnant water from accumulating near the roots, as it is injurious to the root system of the trees.

This period of the year, while the crop is developing, is a good time to overhaul the trees. All exhausted wood and "water" shoots should be removed and the lower branches shortened to keep them clear of the soil. During the autumn rains there is a danger of brown rot infection: If the branches are trailing the warm moist soil does not become dry readily and the spores of brown rot developing on the soil will rapidly infect the fruit and foliage. Spraying the trees with Bordeaux, 3–4–50, as recommended in last month's notes will assist in controlling the brown rot.

—L. Paynter, Orchard Instructor, Auckland.

POULTRY-KEEPING.

Winter Eggs.

As the season of dear eggs is now at hand, this is a critical period for the poultry-keepers, for upon the proper management of the pullets depends largely the profits to be secured at this period of the year. The production of eggs during the winter season is quite artificial, and therefore the pullet bred out of her natural season must be treated in an exceptional manner if eggs are to be produced in good numbers during the season of high prices. If bred at the right season and managed to the best advantage up till now the pullet should now be laying or on the point of laying if conditions are favourable.

There must be no weak link in the chain of management. The reason why some poultry-keepers fail and others succeed in securing eggs when these are most valuable is because in the one case some essential factor in management has been neglected, while in the other case the birds have been handled to the best advantage throughout. These remarks apply to the artificially bred high-type layer, bred to lay when we want her to and not when nature dictates. If any evidence is required to indicate the

necessity of this special care of the laying fowl in the season of dear eggs, it surely is contained in the fact that notwithstanding the greatly increasing number of record egg-laying stock distributed throughout the country and hatched (by artificial means at the right time), eggs still command a high price at certain seasons: certainly much dearer than they would be if all the birds, or even the half of them, hatched to lay now, were doing so. This emphasizes the fact that a big percentage of these birds has not been properly managed. Apart from the management of the pullet intended for winter egg production, it is realized that the farmer, or his wife, who has studied egg production on right lines, experiences a greater difficulty every year in securing the necessary broody hens to have a desired number of pullets hatched out at the right season for the production of dear eggs, for the more the egg-yielding power of the flock is improved, the greater becomes the tendency for the brooding instinct to diminish. Because of this it is often advisable either to use an incubator or to purchase day-old chicks, or pullets when from ten to twelve weeks old. The latter, bred from reliable stock, may now be purchased at moderate prices and this method of stocking may be recommended to those small producers who have not the time or do not feel disposed to undertake artificial methods of hatching and rearing chickens. The difficulty, of course, will not be so great with the heavier breeds, but even if the laying strains of these be secured, and they are the only types worth keeping, the question of securing broody hens will become almost as great as with the special egg-producing breeds, such as White Leghorns. Indications are that the time is fast approaching when hatching and rearing by natural means will be almost eliminated from successful poultry-keeping, and while it is the specialists, now incubating only by artificial means, who produce the great bulk of the winter eggs, probably before many years are past it will be the small settler on the land who will be responsible for the main supply. Before this comes about, however, the methods of the specialist will have to be adopted by those to whom poultry-keeping is a side-line. If the pullets are to produce a maximum yield of winter eggs, they must be hatched neither too early nor too late. The birds that may generally be depended upon to produce best are those hatched in September for the light breeds and a month earlier for the heavier. Having pullets hatched at the desired period, however, is by no means a guarantee that a good supply of winter eggs will be secured, but is only one essential requirement. The subsequent management, especially at the commencement of the laying period, when everything in nature is against the bird laying, is equally important.

Although hatched at the right time and well managed up to the laying period, many pullets go into a moult just when high prices for eggs are expected. This may be due to several causes—viz., insufficient food, inferior food, and too many changes in the system of feeding—as well as the most common cause—change of quarters. If the pullet is to attain the highest possible production everything must be done in a proper manner and at the right time. In the first place it is important to have the young birds well settled down in the house they are to occupy during the winter, before they commence to lay. This not only prevents their going into a partial moult with the adult stock, but also is the best means of securing eggs in the season of scarcity. The birds should be fed in the house at all times, provided the house is as roomy as it should be, and the floor well covered with litter, in which the whole grain ration should be provided. This will induce the birds to scratch and hunt for the hidden grains. Exercise is of special importance at this period of the year where the winter laying pullet is concerned. It is only the pullet provided with dry conditions underfoot that can possibly give her maximum egg-yield during the winter months. Standing about in a yard on a cold wet morning waiting for the morning meal does not encourage egg-production. Above all it is well to make sure that the food supplied to the laying pullet is of the best possible quality, irrespective of cost. With

any class of poultry stock, it is false economy to give inferior food because it is cheap. Especially is this the case with pullets at this period of the year. They will simply refuse to eat such food unless, of course, forced to by hunger which naturally results in a decreased egg-yield. Remember that one egg in winter is worth two in summer and that any additional cost in feeding in securing this out-of-season product is more than repaid by the increased price received for it.

The Breeding Cockerel.

On all well managed plants already a rough selection will have been made from the early hatched cockerels, with a view to keeping on the plant the best specimens for future breeding purposes. This is as it should be, for it is seldom that a late-hatched bird proves to be a desirable sire. While the hens for the breeding-pen should be as good as possible, no care is too great in the selection of the male bird. It should be remembered that the male is more than half the breeding-pen, as he leaves his influence on every chicken hatched from him. In the selecting of males for future breeding purposes at this period of the year it is always a wise course to select about double the number of birds that actually will be required for the next season's breeding-pens, for the reason that even the most promising specimen later may develop some serious defect or weakness which would condemn it as a breeder. Unless due allowance is made by having a good number for final selection, annoyance and disappointment is apt to be met with when the next breeding-season comes around. In this important work the necessity of giving first consideration to points indicating health and vigour cannot be urged too strongly. The chief signs of health and vigour are a bright prominent eye, face free from feathers, good bodily development, especially in front, wide across the back, tight feathering, sturdy legs set wide apart, and generally an alert active carriage. One should always beware of the extremely early maturing male. During the early stages it may catch the eye as a pretty little bird, but it usually remains a pretty little bird, and being a diminutive specimen it should not be bred from. Usually it is the slowly maturing cockerel of big frame and having the characteristics indicating health and constitutional vigour which makes, in the long run, the best male to head a breeding-pen. In addition to the points mentioned an endeavour should always be made to select birds conforming to breed type, or in other words to the standard requirements of the breed they represent. This, however, is not to say that if a bird generally conforms to the desired points indicating usefulness it should be rejected merely because it possesses some minor breed defect. While feminine characteristics should be looked for in the female, the sire particularly should be at the other extreme, though coarseness should always be avoided. It is desirable in poultry-keeping to neglect no detail in regard to exercise, cleanliness, proper housing, feeding, and general management, but with the cockerel intended for next season's breeding-pen this attention to detail is imperative.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

Autumn Operations.

By the time these notes are in print beekeepers will be fully occupied in doing the last of their honey-extracting and preparing their colonies for the winter. Should the autumn be mild, final extracting may be later than usual on account of a prolonged flow of nectar. Thistles will probably yield more nectar than other plants, and will, when mixed with clover or catsear, produce a white, clear, and delicately flavoured honey which forms a splendid article for export.

Should late extracting be necessary, great care must be taken to check robbing: an apiary may soon become demoralized if precautionary measures are not taken. When once robbing starts it may prove a difficult matter to stop. Thousands of bees may be killed by endeavouring to enter the wrong hives, and thereby the strength of the colonies be very much weakened; or the colonies may even be rendered incapable of going through the winter. When robbing has commenced, it is most inadvisable to open any more hives until the trouble is controlled. This may be done by syringing with water the offending hives, and in bad cases by placing wet grass over the entrances until the disturbance has been quelled. On no account should combs of honey be left open to attack, or a hive kept open an instant longer than necessary. If the colony attacked be weak, it is advisable to contract the entrance in addition to the above-mentioned precautions. It may be necessary to suspend work in the apiary during the day, doing as much as is thought advisable in the early morning.

Foul-brood.

At all times of the year foul-brood is a menace to the beekeeping industry, and it is advisable always to keep a sharp lookout for any symptoms of it. This is especially the case during the spring and autumn months; and before pronouncing any colony fit for wintering the brood-nest should be examined carefully for the slightest sign of the disease. If a trace is discovered, or the disease is found in a more advanced state, judgment must be used as to the advisability of destroying the colony completely or of treating it.

Winter Stores.

As advised last month, it is well to determine the quantity of stores available in the hives for winter consumption. A plentiful supply is sound economy, and my advice is that not less than 30 lb. of honey be left in each hive. There are occasions when late swarms have not gathered sufficient for their own wintering purposes, and then they must be fed either with clean, healthy honey, or with sugar-syrup. One should never use honey from an unknown source.

Cleanliness and Order.

Before finally leaving the hives for winter it is a good plan to scrape the bottom-boards free of all the rubbish that has accumulated during the summer, thereby helping to keep the bees in a healthy condition, and also to scrape the alighting-boards clean, and to clear any long grass surrounding the hives, as this will tend to keep away dampness. The hives should be placed on blocks several inches off the ground, and in a sheltered position where they may receive a considerable portion of the day's sunshine. Any leaky covers or split supers should be removed from the hives, and sound ones put in their place. It should be remembered that bees require dryness and warmth.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

Season 1934–35.

THE weather has been comparatively hot and dry for an unusually long period, with the effect upon the crops that might very well be expected. Land which lay in a warm dry position practically "went out of business" after the early crops were gathered, and cooler districts enjoying a good water-supply will have to supply the market with winter crops. Where tanks can be securely placed a small motor and pump may accumulate a

sufficient supply that is applied by gravitation as required: otherwise a powerful motor and pump of the requisite capacity are necessary to make a direct supply. The water dam or cistern is little used in this country, but in warm localities apt to run short of water it is worthy of consideration: the amount of water that may be obtained from a comparatively small catchment area is somewhat surprising—the problem is to store it securely.

As was to be expected under the weather conditions, insect pests attacked the crops to a greater extent than fungous diseases. There is a general tendency to blame the white butterfly for all insect damage. As a matter of fact, the caterpillars of two native moths were responsible for quite a lot of damage. They are *Plusia chalcites* and *Mecyna maoralis*. The former is rather a handsome moth, with shaded dark brown velvet wings ornamented with metallic-like plates: in the caterpillar stage when it attacks especially bean and tomato crops its colour is pale green and yellow in longitudinal stripes. The speckled larvæ of *Mecyna* are less common, but when they descend on a plant of kowhai, of which they are very fond, the plant is suddenly defoliated before one has realized that the attack has taken place: this is due to the great number of caterpillars and their restless energy. At the slightest disturbance they drop to the ground and are out of sight among the litter in a moment, thus creating a feeling of false security in the mind of the owner, when, as a matter of fact, their activity is such that they are very soon back again to complete the work of destruction unless steps are taken to protect the plant. Fortunately a light dusting or spray of arsenate of lead will destroy these and all other kinds of caterpillars most effectively, but it is necessary to keep a sharp lookout, especially in fine weather which is so much to their advantage.

Again, as was to be expected, tomato crops suffering from lack of water had the fruit affected with blossom-end rot, which is not due to any specific organism. In some instances a surprising quantity of fruit was rendered useless by the development of this condition. Where the water-supply was sufficient crops were heavy, except for the destruction of a percentage of plants by spotted-wilt disease. This virus disease causes the young leaves to develop suddenly a bronze sheen and stops the growth; it was most active about mid-summer. As it is considered to be spread by the agency of thrips, one can understand why it is prevalent in a fine season. These insects are elusive, and it is doubtful if they are present in very large numbers; but the damage they may do is so impressive that they must be regarded in a new light. They are not sufficiently numerous to do serious damage by feeding on the juices of the plant. The danger arises when they pass from an infected to a sound plant, which in the process of feeding they inoculate with the virus. This indicates the necessity of destroying infected plant material so far as possible. Unfortunately the virus has an unusual range of herbaceous host plants, which include many popular garden plants as well as common weeds. So that in addition to rogueing infected plants in the crop, it is advisable to have the frame yard, where the plants are raised, in rather an isolated position, and to suppress any nearby rough growth which may harbour the disease. A special study of this disease has been made during the season, and a very full report may be expected shortly.

The uneven colouring of tomato fruits may be due to a variety of causes, but one of them is undoubtedly high temperatures. This was very noticeable in certain crops under glass; it is no great cause for wonder as many fruits, even when grown outside, will literally burn if they are not sufficiently shaded from long periods of very hot sunshine. The experience indicates that under such conditions this crop under glass would benefit by the application of a shading wash on the roof of the house in addition to the generous use of an ample ventilating equipment.

Preparation for the coming Season.

It is common knowledge that good crops may be grown readily enough if the land is in good heart, but this will not be its condition after a few years of cropping unless a few matters have received careful consideration and attention in season. Drainage, water, shelter, crop rotation, cultivation, and manures are some of these matters.

Intensive cropping is most successful on good land with an open subsoil, especially when the crops are planted out under glass. The forcing culture usually demanded in that case requires an ample supply of water at certain periods, and where natural drainage exists water can be applied with best results. In the absence of good drainage the land is cold until late in the season, and its texture and fertility gradually deteriorate: poor late growth is then the result in spite of the high temperatures obtained later in the season. Where land of this class has to be dealt with a thorough drainage scheme should be planned and carried out as circumstances permit. It may be too big an undertaking for immediate execution, but what is possible should be done between seasons until the full scheme is completed. It will consist probably of open drains to carry away the water received from tile drains. Drainage is work which requires careful planning and close supervision to ensure that the tiles are laid truly, at the right depth, and with a suitable fall. Work of this kind should be pushed along now, giving land under glass the first consideration.

The preparation of the land for next season's cropping compels a decision on the location of each crop, thus bringing up the subject of crop rotation, which must always receive attention if the land is to be kept clean and in good heart. In Jersey where for many years early potato crops have been grown for the English market we are told "the average holding is 18 acres of which one-third would be cropped with early potatoes. There is no fixed rotation, but in terms of first crops the following is common practice. Grass for three years either for grazing alone or mowing and grazing, followed by early potatoes for three or four years. A second crop, usually roots, is taken the same year after potatoes . . . When the land is sown in grass it is done in place of the root crop, about July or August (January or February here), and is usually well established before winter." Under this arrangement the land is in grass and grazed or mown for from three to six years before it is broken up for cropping. It would then be comparatively clean from serious pests and diseases, well stocked with fibre and humus, and in great heart for cropping. The farm stock would supply the necessary manure, which it is stated is applied at the rate of not less than 25 tons per acre every two or three years. With a generous application of mixed artificial manures before the final cultivation and planting, it is not surprising that good crops are harvested there and the land is maintained in the best condition.

The practice here in many cases is to keep the total area continuously under a system of double cropping annually, which is often a very difficult task if the land is to be kept in good heart for a long period. Under the best conditions—that is, good land and rainfall, and a good supply of farm manure—experienced farmers are obtaining good results with continuous cropping, which cannot be expected under less advantageous conditions in which a system along the lines mentioned above is generally advisable.

Towards the end of April land available for early cropping should have a dressing of organic manures turned under for such crops as require it, while land for late crops, such as tomatoes, may be sown down to oats or barley and horse beans, or other green crop which will make good growth at that season, for ploughing under.

Where new land is to be broken in, hedges should be trimmed well back and the land skim-ploughed to a depth of about 3 in. When the turf has rotted sufficiently, it should be disked, and afterwards, in suitable weather, ploughed deeply and worked to a fine tilth for planting.

The Homestead Garden.

A new lawn should be cut when the grass is 2 in. or 3 in. high and in dry condition. It should be cut as high as the adjustment of the mower permits, as close cutting will be detrimental until a good sole of grass has been established. For this work the mower should be well oiled and carefully set: with most kinds of mowers this is done by an arrangement which permits the cutting edge of the bottom blade being raised or depressed. The right position is that where the revolving cutting cylinder makes an even contact with the bottom blade along its whole length without jambing.

The herbaceous border where it is intended to grow the popular dahlias, chrysanthemums, and other plants grown as annuals may now be planted with spring flowering bulbs and other plants, which can be removed in October and November, in time for planting those mentioned above which make a display in summer and autumn.

The perennial herbaceous border, where the plants remain for three or four years before replanting, should be planted now. Planning this section is a very good test of one's skill and art in arranging colours and foliage. As it is generally one of the prominent features it should receive special care. Good effect is due not so much to the rareness of the plants as to the arrangement and size of the groups. It should be remembered that the quantity, as well as the kind of colour, is important; as colour may easily be so great as to be monotonous or so small as to be insignificant. If the plan is drawn to scale on graph paper it may be transferred to the land by placing a numbered label in the ground each yard along the border front and back: then a garden line or two from end to end dividing the border into strips, each a yard wide. The group outlines as planned may then be drawn on the ground and the drills filled with dry sand. Each space should be marked with a clearly written label, and planting may be done true to plan as occasion permits.

Where the time has arrived for the perennial herbaceous border to be replanted, it is well to lift a group at a time, select suitable pieces for replanting, and place them compactly in a seed box with the name attached so that they may be conveyed to the kitchen garden and planted in nursery rows properly named and remain there until early spring when they will be well rooted. By that time the border should be thoroughly reconditioned by manuring and trenching, and in a settled state suitable for replanting. Where this section is kept well within ones's resources of time and available labour it can afford great pleasure and form a very attractive garden feature.

Herbaceous perennials, bulbous and otherwise, may be planted in the shrubbery and plantations with good effect, but always they should be of a kind that will flourish without the high culture referred to above. Many kinds of daffodils, lilies, scillas, &c., may be planted in established shrubberies, and will be most happy if they are left alone.

—W. C. Hyde, Horticulturist, Wellington.

The fifth Science Congress organized by the Royal Society of New Zealand is to be held at Dunedin from 28th May to 31st May next. The work of the Congress will be divided into sections, including an Agriculture section, the secretary of which is Mr. C. V. Dayus of the Department of Agriculture, Dunedin.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

WORMS IN CALVES.

D. J. B., Onui, Waikato :—

A number of calves have become seriously affected with parasitic worms in the lungs. Examination of a slaughtered calf showed the lungs to be infested with the worms. Is there any cure for these worms ?

The Live-stock Division :—

It is always a wise procedure to dose calves with the copper-sulphate solution where you have a parasitic infection, for the stomach worms are the most common and dangerous.

Where you find parasitic infection of the lungs you usually have the stomach worm as well. Small doses of turpentine and milk, a dessertspoonful to a tablespoonful of turpentine, given every second day in about three-quarters of a pint bottle of sweet milk, will assist greatly, but along with this it is necessary to feed the young animals well ; a little oats and bran, twice daily, if they will take it, also good hay moistened with a solution of molasses (1–10), and after dosing a change of pasture ; when dosing shake the bottle at intervals.

The chloroform treatment simply consists of administering chloroform, but not giving too much. The chloroform may be applied on a sponge and the animal's head put in a canvas muzzle, but this should be done only by an experienced person who knows exactly how long to proceed. The nose of the animal should be smeared with vaseline.

DIFFICULT CHURNING.

M. K. F., Stanley Brook :—

We are having considerable difficulty in churning our butter. The first time, in January, after the cream became thick, we could get no further change in it. We churned for about two hours, and tried again the next morning, but could not get it to churn to butter.

The Dairy Division :—

The difficulty experienced in churning is one which is not uncommon in warm weather or when the pasture on which the cows are grazing is dry. In a year like the present one difficulty is experienced in cooling the cream, and this, combined with the dry feed, is probably the cause of the long churning period. Under farm conditions the control of the temperature depends on the water available, and fairly thick cream should be skimmed, and it should be churned frequently to prevent the development of acid. With green feed, cooler temperatures, or a fresh cow in the herd, the trouble usually disappears. It is inadvisable to fill the churn too full.

SEED-CROP OF BLUE LUPINS IN NORTHERN DISTRICTS.

C. A. G., Lyall Bay :—

What may be considered a reasonable possible yield of seed of blue lupins an acre on light volcanic land of good average quality at Kerikeri ?

The Fields Division :—

Blue lupins grow fairly well on the light volcanic land at Kerikeri, and the climatic conditions are suitable for a seed crop. A reasonable yield of seed would be about 30 bushels to the acre. For a good seed-crop the lupins should be planted about the middle of October : with earlier planting too much leaf and stem is developed and the flowering is restricted. On the other hand, according to locality, the lupins should be planted sufficiently early to allow for rapid growth during November and December, when flowering takes place. The seed ripens quickly in January.

UDDER AND SKIN TROUBLE IN COW.

J. M. F., Manurewa :—

A cow (about the fourth calf) calved some eight or nine weeks ago, and her milk seemed sound until about three weeks ago, when the milk from the front two teats suddenly became tinged a deep blood-red colour. The milk from the hindquarters remained normal. She had not been subjected to any known violence. Her health appears normal save that she has been losing her hair in patches from the neck and shoulders. She is a poor yielder, both in quantity and quality.

The Live-stock Division :—

Relative to the cow which appears to be giving blood in the milk from her two front quarters, this condition cannot always be accounted for. It results, sometimes, after calving, from the rupture of small blood vessels, possibly due to physiological changes in the udder. It usually disappears without any treatment whatever. Sometimes, but very seldom, it may be caused by injury.

That she is losing the hair in patches from the neck and shoulders might be caused by ringworm. If you treat ringworm with kerosene, soap, and water, you will clean it up ; dissolve 1 lb. of hard soap in 1 gallon of hot water, and while hot add 1 pint of kerosene and stir well. This makes an emulsion which you may use to wash down the affected parts. Two dressings at intervals of three days should clean up the condition. Any definite round spots you may also paint with tincture of iodine or sulphur ointment.

ASPARAGUS CULTURE.

New Chum, Waitomo Caves :—

The foliage of a bed of asparagus now two years old was cut this year when the berries had turned red. Since then the plants have sent up shoots which are now developing foliage. Is this detrimental to the plants ?

The Horticulture Division :—

The foliage on the asparagus is by no means detrimental ; on the contrary the plants should be manured as required with a view to encouraging a strong growth, as that treatment will increase the crop of spears for cutting next spring. The foliage should be cut down in autumn each year when the ripening process is well established.

VINES FOR CANTERBURY.

J. S. W., Horrelville, Rangiora :—

The soil here is flat, and inclined to be wet during a wet winter. The depth of soil averages about 10 in., and there is about 8 ft. of sandy clay beneath the soil. It is rich river-silt land mostly, growing good crops of wheat. Which varieties of vines would be best suited for the soil above described ? Where can, say, half a dozen vines be bought—preferably ones grafted on phylloxera-resistant stocks, as it is considered it would be advisable to start with those in case the disease ever becomes prevalent in this district ?

The Horticulture Division :—

For the conditions described the following varieties of table grape vines are recommended : One Gamay hatif des Vosges, one Madeleine Alice Salomon, two Golden Chasselas (Salomon's selection), and two Portugais bleu. Three other good varieties which should give satisfaction under your soil and climatic conditions are the Madeleine Royale, the Chasselas Rose Royale, and the Sicilien, but we have no grafted vines of these, only rootlings and cuttings. The other vines are grafted on suitable resistant stocks. In this connection the risk of an invasion of phylloxera into your district is very remote. It was found in Auckland City some thirty-five years ago, but up to date has extended northwards only. All the above varieties can be obtained from the Te Kauwhata Horticultural Station in August on the conditions set forth in the price-list forwarded. It would be advisable to plant the vines at least a chain away from the macrocarpa hedge, or, if planted more closely, to cut a deep ditch along the hedge to prevent the roots robbing the vines. A covering of scrim when frosts are expected would protect the vines.

WEATHER RECORDS: FEBRUARY, 1935.

Dominion Meteorological Office.

NOTES FOR FEBRUARY.

FEBRUARY saw a continuance of the abnormally warm weather which had been experienced during the preceding three months, but also the break of the drought which had accompanied it in most districts. The beginning of the month was very dry but after the first week humid weather prevailed. Rain became more frequent and widespread and drought conditions were gradually dissipated. Northern districts were the first to be relieved but the rain gradually extended southwards and culminated in the heavy and general rains which fell between the 19th and the 24th. Further rain is still needed in North Canterbury and especially on the Wairau Plains in Marlborough. In most districts the grass is coming away well again and in the North Island there has been luxuriant growth. Stock are in good condition and the milk yield is recovering somewhat. The rain was too late to give a good wheat yield or to save some of the fodder crops. All crops and fruits are maturing early.

Rainfall.—There was a large excess of rainfall over the whole of the North Island, many places having more than double the average fall. In the South Island most of Nelson and Westland, the Alps, and the eastern foothills had more than the average, but elsewhere there was still a deficit. This was large in parts of Marlborough and Southern Otago and Southland.

Temperatures.—Temperatures were much above normal, the departures ranging approximately between 2·5° and 5° F., those on the West Coast being the greatest. There were continuously high temperatures until the 23rd, when a cold spell set in and lasted till the 27th. The four months from November to February have been by far the hottest in the history of the Dominion, and this is true of all parts. Other occasions when the same months were very warm were the 1894–95, 1909–10, 1916–17, and 1923–24 seasons. On the present occasion, however, the average excess above normal is almost double the next hottest. Very few places have, however, experienced their hottest individual temperature. Auckland is one of the few that has.

Sunshine.—Sunshine was considerably below normal in most eastern districts but above it in the west. Hokitika had the remarkable record of 270·2 hours. New Plymouth had 247·9 hours and Alexandra 237·2.

Storm Systems.—There was no storm of note during the month. There is no doubt, however, that in the continued hot weather great quantities of moisture had been taken up into the atmosphere and it required only a slight disturbance to cause heavy precipitation. In the early part of the month the unstable conditions were shown by the frequency of thunderstorms and heavy local downpours. These continued until the last week but in the later stages were associated with more general rains.

Some heavy rains occurred in North Auckland at the end of the first week of the month in association with several shallow depressions which were unproductive over most of the remainder of the Dominion.

A second and rather similar series of depressions in the middle of the month caused heavy rains over most of the North Island, especially on the 15th.

The wettest period in the month commenced in a similar way on the 19th and continued till the 24th. On the 22nd the rains were general, and the greater part of the country recorded very heavy falls. Portions of the eastern districts of the South Island, however, again escaped lightly. The heavy rains during this period were associated with a strong invasion of cold air from the south which forced up the warm and damp air over the Dominion, causing it to drop a large part of its moisture.

RAINFALL FOR FEBRUARY, 1935, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average February Rainfall.	Total Rainfall to Date.	Average Rainfall to Date.
			North Island.			
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitaia	8·55	16	2·38	3·50	10·35	7·44
Russell	13·48	13	3·30	2·99	15·28	6·24
Whangarei	8·19	14	1·43	3·87	12·12	7·80
Auckland	9·62	11	4·09	3·12	11·86	5·84
Hamilton	3·93	12	1·98	2·91	5·13	6·48
Rotorua	5·96	16	2·99	3·69	7·80	7·95
Kawhia	6·16	15	3·20	2·86	8·00	6·41
New Plymouth ..	9·47	9	7·29	3·79	14·08	7·98
Riversdale, Inglewood ..	16·08	13	10·90	6·03	24·64	13·54
Whangamomona ..	8·39	6	2·90	3·89	20·10	9·47
Hawera	7·91	12	5·61	2·40	10·15	5·91
Tairua	9·99	10	4·21	4·68	11·38	8·34
Tauranga	3·69	13	0·86	3·51	4·65	7·59
Maraehako Station, Opotiki	5·68	13	2·11	4·14	8·43	7·73
Gisborne	4·89	14	1·90	3·46	6·01	6·18
Taupo	8·98	14	2·48	2·74	10·36	6·11
Napier	5·87	12	1·39	2·78	6·28	5·71
Hastings	4·28	16	1·35	2·25	4·76	4·18
Whakarara Station ..	8·06	14	2·84	..	9·63	..
Taihape	5·50	12	1·67	2·19	8·16	5·39
Masterton	3·68	14	0·90	2·73	4·48	5·33
Patea	8·56	11	3·86	2·40	11·10	5·99
Wanganui	7·31	10	3·48	2·42	9·98	5·25
Foxton	3·39	5	1·48	2·07	5·09	4·21
Wellington	3·40	9	1·11	2·67	5·27	5·48
			South Island.			
Westport	6·75	14	2·24	5·35	18·14	13·55
Greymouth	7·30	5	2·77	6·21	21·65	15·38
Hokitika	11·16	9	9·17	7·19	27·65	17·26
Ross	10·43	6	7·56	8·90	25·64	21·30
Arthur's Pass ..	12·84	8	6·90	9·90	33·14	24·02
Okuru, South Westland	5·70	4	3·60	9·66	30·88	22·25
Collingwood	2·46	5	1·53	5·13	8·51	11·71
Nelson	2·96	9	1·05	2·63	6·23	5·44
Spring Creek, Blenheim	0·51	7	0·24	2·18	1·64	4·40
Seddon	0·56	3	0·40	1·85	1·81	3·69
Hanmer Springs ..	3·85	15	0·73	3·20	5·89	7·10
Highfield, Waiau ..	2·82	11	0·90	2·60	3·61	5·58
Gore Bay	2·63	10	0·91	2·80	4·35	5·26
Christchurch	1·04	12	0·31	1·74	1·81	3·92
Timaru	2·30	10	0·78	1·84	4·61	4·11
Lambrook Station, Fairlie	1·91	5	1·24	1·81	4·58	4·24
Benmore Station, Clearburn	3·65	10	1·47	1·62	5·53	4·39
Oamaru	1·75	12	1·04	1·79	3·28	3·83
Queenstown	1·92	6	0·57	1·94	6·27	4·86
Clyde	1·67	7	0·76	1·06	3·61	2·91
Dunedin	2·40	11	0·74	2·73	5·44	6·16
Wendon	1·65	7	0·65	2·26	5·88	5·46
Balclutha	1·64	7	0·58	1·99	5·68	4·30
Invercargill	1·53	10	0·43	3·12	8·72	7·13
Puysegur Point ..	1·65	8	0·66	5·74	16·54	13·36
Half-moon Bay ..	1·08	8	0·31	4·08	9·17	8·90